PRESERVE SIGHT
PREVENT BLINDNESS

PRESERVE SIGHT PREVENT BLINDNESS

(Profusely Illustrated)

by

N. C. SINGHAL

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RESPECTFULLY
DEDICATED TO MY FATHER
SHREE LEKH RAM
WHOSE SACRIFICE AND GUIDANCE
INSPIRED ME ALL THROUGH AND
WHO IS STILL AMONGST US TO
INSPIRE AND GUIDE

"If a man can write a Better Book, preach a Better Sermon or make a Better Mouse Trap than his neighbour, though he builds his house in the woods, the world will make a beaten path to his door."—Emerson.

Foreword

by

DR. SUSHILA NAYAR

Minister for Health, Government of India, New Delhi

We generally take eyesight for granted, but the least trouble with our eyes makes us realise vividly how important is the sense organ of sight. It is the window which connects us with the outer world and influences our intellectual development. Of all the senses which connect man with the outer world, eyes play the most important role. Protection of the eyesight, therefore, should be the foremost concern of each and everyone. It is amazing how little an average individual knows about his eyes, their working and their care in the day to day life. India has the largest number of blind or economically blind individuals. Nutritional deficiencies play an important role as a cause of blindness to be beaten only by smallpox which has been the cause of the largest number of cases of blindness in the past. Blindness from both of these causes is preventable. Another cause of blindness and poor vision is corneal opacities caused by infections of the eye. Major part of these cases are also preventable. In fact, there are very few cases of blindness in India which cannot be prevented with our present knowledge provided that knowledge can be translated into practice.

I therefore welcome the book—*Preserve Sight,. Preuent Bindness*—by Dr. N.C. Singhal, which deals with the problems of vision, light, colour, common eye diseases prevalent in the country and their treatment, care of the eyes of the newborn and children both in the school and at home. I have read the book with great interest and I am sure anyone who reads it will benefit from the simple narrative describing methods of care of the eyes and methods of prevention of various eye ailments.

It will bring home the need for correct vision. A few illustrations for the school teachers to enable them detect errors of refraction from the posture of the children will be useful. I commend Dr. Singhal's book to the general practitioners, nurses, school teachers and the general public. It can help in spreading the message of proper care of the eyes and thus considerably reduce the preventable blindness in the country.

Preface

I made up my mind to write this book after the celebration of the World Health Organisation day whose slogan was "PRESERVE SIGHT, PREVENT BLINDNESS". I realised then that the public was in need of a book which contains in the most non-technical terms the preventive measures of eye diseases.

An average man knows so little about his eyes. Whatever little he knows about his eyes is hearsay. Often he is misinformed from sources most interested in selling a product. Many are worried too much on the appearance of a minor trouble in the eyes because they rightly regard their eyes the most important organ of the body. Without light there is no life.

A simple boil occurring elsewhere on the skin does not worry an individual but same thing occurring on an eye-lid causes lot of worry partly because of fear of losing eyesight and partly because he is afraid to put any medicine in the eye suggested by a friend. His fear is justified for the latter but not for the former. There are some simple operations on the eye which have nothing to do with the eyesight and I *have repeated this sentence many a time while describing* the diseases to emphasize that one should not be afraid of getting an operation which has nothing to do with eyesight. It has been my experience that many patients do not submit for operation for fear of losing eyesight till the disease advances and destroys the eyesight to a variable degree permanently.

I have attempted in this book to tell what is serious and what is not serious and answer many questions which have been asked frequently from me while dealing with the patients. Common eye diseases and common causes of blindness have been described and preventive measures by simple means have been set forth.

This book is chiefly written for the public in simple English without recourse to medical terms as far as possible, although inevitable reference has had to be made to some technical terms. I feel that the book will also be useful for the medical practitioners who will find answers to many questions commonly asked by their patients regarding the eyes.

It has been a somewhat difficult task to present in a perfectly , lane language an admittedly technical subject. I trust, however, that I have succeeded in my attempt to set forth in a simple language, the guiding principles of eye hygiene.

I should like to take this opportunity of thanking Dr. S.N. Mitter—an eminent eye surgeon of Delhi for his valuable advice, Col. C. S. Krishnamurty, Adviser in Ophthalmology, Armed Forces in India for his guidance and Dr. K. N. Shukla, Staff Surgeon in Safdarjang Hospital, New Delh, iregarding suggestions of some simple substitutes for technical terms. I also acknowledge the help given by Dr. C. L. Pury of Atma Ram & Sons who has kindly revised the manuscript.

Suggestions for the improvement of the book will be gratefully acknowledged.

New Delhi N.C. SINGHAL
March, 1963

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Introduction

Of the five senses, possessed by us, vision alone is responsible for more than 4 5ths of our awareness of things around us. A sharp noise, an unusual smell, a strange touch all attract our eyes immediately.

Most of us are quite unaware of the importance of our eyes. We may not have realised how intimately they are bound up with all our waking life and actions. But as far back as we can trace the records of man, vision has been the most cherished of his possessions next to life itself. In fact, life without vision is valueless.

The human eye sees better than most animals. Our field of vision is wider than that of any other living thing. We can recognise the finest gradations of colour. We may not be quite so far sighted as the eagle or so quick to detect fine movements as the deer or rabbit but we possess something far more valuable. This is the ability to judge distances of various objects which few animals can do.

We are superior to the animals, because we see the same objects with both eyes. Only the highest in the scale of evolution have this gift. This means that each eye sees the same object at the same time from a slightly different angle and forms two slightly dissimilar images of an object on the two retinae. Our brain fuses these two images into one composite having the elements of depth and distant perception.

Animals with eyes at the side of the head do not possess this gift. Their right eye does not know what their left eye sees. These animals see a flat two-dimensional world. A child who is born blind in one eye or loses the sight of one eye before he can store up sufficient visual experiences has this kind of flat vision. He may become a great physician, a writer, or a musician but never a painter.

Handicap due to loss of one of the four senses *i.e.* touch, smell, taste and hearing, is no doubt there but the greatest handicap is due to loss of vision. Degree of psychic trauma suffered by a person fearing blindness is next only to impending death. Every part of the body has some useful function to an individual and must be in sound state for comfort of life but eyes are the most important and precious organs of an individual which permits him to see and appreciate this universe and make this life worthwhile.

There are about 10 million blind persons in the world. One-fifth of this is found in India. This figure does not include the partially sighted people who can earn their living. It is surprising that two-thirds of this number in India is the result of causes which are preventable and diseases which if detected and treated early are curable.

With proper measures of prevention and proper treatment by drugs and operations sight can be restored to many who are now losing through ignorance. Except for Egypt and certain areas in Africa, the incidence of blindness in India is the highest in the world. 30% of blind people in India have lost their sight before the age of 21 and most of these (6,00,000) became blind in the first five years of life.

The above introduction should be sufficient to arouse interest in the minds of the people about the need of preservation of sight and prevention of blindness.

In this book I have tried to explain the common eye diseases, how to recognise them and what a patient should do on his part. There are many eye diseases which have nothing to do with the eye sight but the patient becomes mentally perturbed on the appearance of such diseases. He is afraid of developing permanent defective eye sight or loss of total sight. This mental anxiety unnecessarily wrecks the whole human machinery.

1

Parts of the Eye

1.1. Appearance of the Eye

Each eye is placed in the bony socket of the skull on the front of the face and the two sockets are separated by the bridge of the nose. The eye lies in the socket on a fatty cushion and is held by six muscles which move it in various directions.

Each eye has two lids, upper and lower. The lower lid is normally immobile while the upper lid moves freely. The two lids meet at the inner and outer corners. Between the two lids there is a gap when the eyes are open and this gap is called the

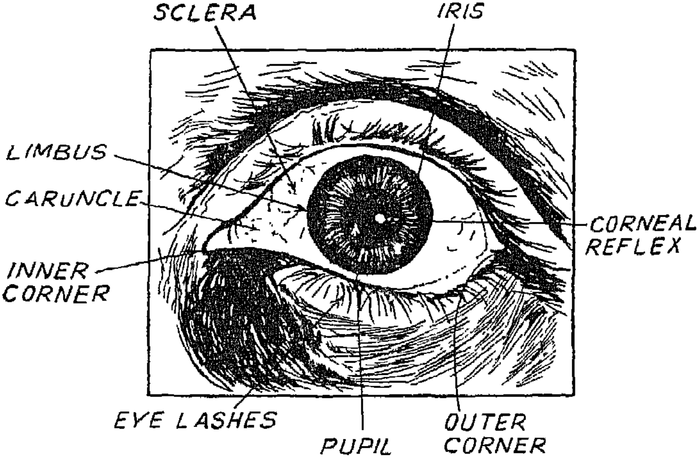


Fig. 1.1—External parts of the Eye.

lid, aperture. The apertures of the two eyes are equal and symmetrical. Each eye lid has a margin from where arise the eye lashes arranged in two to three rows. The upper eye lashes are directed forwards and upwards and the lower ones are forward and downwards. Just behind the eye lashes there are multiple minute openings through which an oily secretion comes out. It prevents the overspilling of normal quantity of tears.

Now look at the open eye of a person. You are looking his eye through the lid aperture and you see a central circular black part which is surrounded by two triangular white parts on either side.

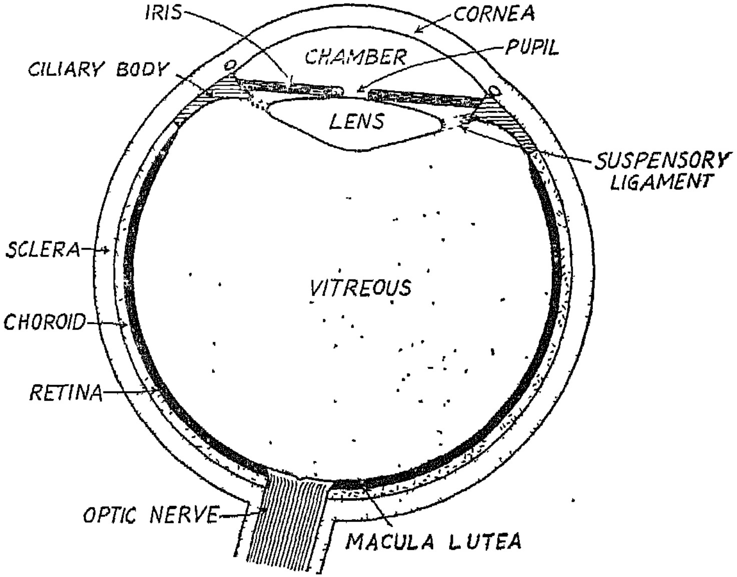


Fig. 1.2—Internal part of the Eye.

1.2. Black Part and Interior of the Eye

Its most forward part is a circular transparent structure called Cornea. Behind it there is a small space called the Chamber.

This space contains a watery fluid. Behind this is a circular brown or bluish curtain having a central opening. This curtain is called the Iris. The iris is variously coloured. By the colour of the iris we mean the colour of the eye. The central opening is called the Pupil Behind the plain of the iris is the Lens which is transparent and is normally not visible But if it becomes opaque (cataract) it is visible as a white structure through the pupil.

Behind the lens is a cavity full of jelly-like fluid called the Vitreous which helps in maintaining the shape of the eye ball. If this is removed, the eye ball collapses.

The lens is suspended between the iris and the vitreous and is held by a fine threadlike structure called the Suspensory ligament. The other end of the ligament is attached to a muscular structure called the Ciliary Muscle. The ciliary muscle is continuous with the iris and is not visible.

Surrounding the vitreous is a highly sensitive layer of nerves called the Retina. The central part of this retina is more highly developed than the rest and is called the Yellow Spot because it is slightly yellow coloured. Just close to the yellow spot is a circular pinkish white spot called the Optic Disc. All the nerves of the retina collect at this white spot and leave the eye ball behind to form a nerve called the Optic Nerve. This optic nerve goes backward to the brain. The whole of the retina is capable of forming the image of any seen object but not the optic disc which is insensitive to light.

Outside the retina is another layer called the Choroid which consists of blood channels and black pigment. It supplies nutirition to the retina. This choroid is continuous in front with the ciliary muscle.

Outside the choroid there is a white tough layer called the Sclera. It being a rigid structure maintains the shape of the eye.

1.3. White Parts

If you raise the upper lid or pull the lower lid down, you see a white part which is continuous all round. It is called the Sclera and is continuous behind with the same white tough structure which surrounds the choroid. The junction of the white part and the black part is called the Limbus. Close to the limbus and in the white part there are few greyish or blackish irregular spots which are irregularly scattered. This may be present in the visible portion of the white part or may be in the part covered by the lids. Some people while looking into the mirror may see these spots for the first time and get worried. In actual fact these are of normal occurrence.

Near the inner corner of the eye and lying on the sclera is a small pinkish nodule called the Caruncle.

Covering the white part of the eye there is a thin membraneous structure called Conjunctiva. It contains several blood channels which are normally visible on the surface of the eye ball. This conjunctiva starts at the limbus and covers the visible part of the sclera and that which is covered by the eye lids. Then it is reflected forward to the inner surface of both the lids. It ends at the margin of the lids near the eye lashes.

1.4. Tear Apparatus

Above and to the outer side of the eye ball there is a gland called the Tear (Lacrymal) gland. It lies in a small depression on the upper wall of the bony socket. It secrets a watery fluid called tears which it discharges on to the surface of the conjunctiva. This watery fluid slowly moves towards the inner corner of the eye and keeps its surface moist. Near the inner ends of the upper and lower lids are tiny openings called the

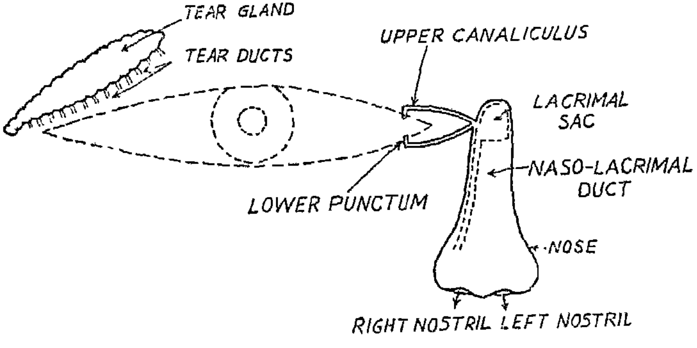


Fig. 1.3—Diagram showing Tear Apparatus.

Puncta. They are normally in contact with the surface of the eye ball. If you pull the lower lid down the punctum can easily be visible. From the puncta arise very narrow channels (canaliculus) which lie in margin of the lids. These two channels reaching the inner corner of the lids, open together into a small dilated bag called Tear (lacrymal) Sac (*see* Fig. 1.2).

This sac lies under the skin between the inner corner of the eye and the bridge of the nose. It lies in a small bony depression which separates it from the cavity of the nose. From the sac arises a narrow channel called the Naso-lacrymal duct. It runs downwards and has a length of 12 to 24 mms. Its other end opens into the nose. Puncta, channels, sac and nasolacrymal duct together constitute the Tear Apparatus.

The tears coming from the tear glands and after lubricating the surface of the eye ball collect near the caruncle Here the puncta are in contact with the eye ball. The tears enter the puncta and passing through the channels, sac and nasolacrymal duct enter the nose. Here they evaporate by the breath. Normally the tears are prevented to overflow over the cheeks by the oily secretion on the lid margin as pointed out already. When there is overproduction of tears as in weeping or in some disease of the eye neither the drainage channel is competent to drain all the fluid nor the oily secretion prevents its spilling over the cheeks.

1.5. Muscles of the Eye

Each eye is connected to the bony socket by means of six small muscles. Four are straight and two are oblique. They are not visible. The four straight muscles are upper, lower, outer, and inner attached respectively to the eye ball. They move the eye ball up, down. to the inner and to the outer side. The two oblique muscles move the eye ball obliquely *i.e.* up and out or up and in or down and out or down and in.

2

Defects of Eyelids

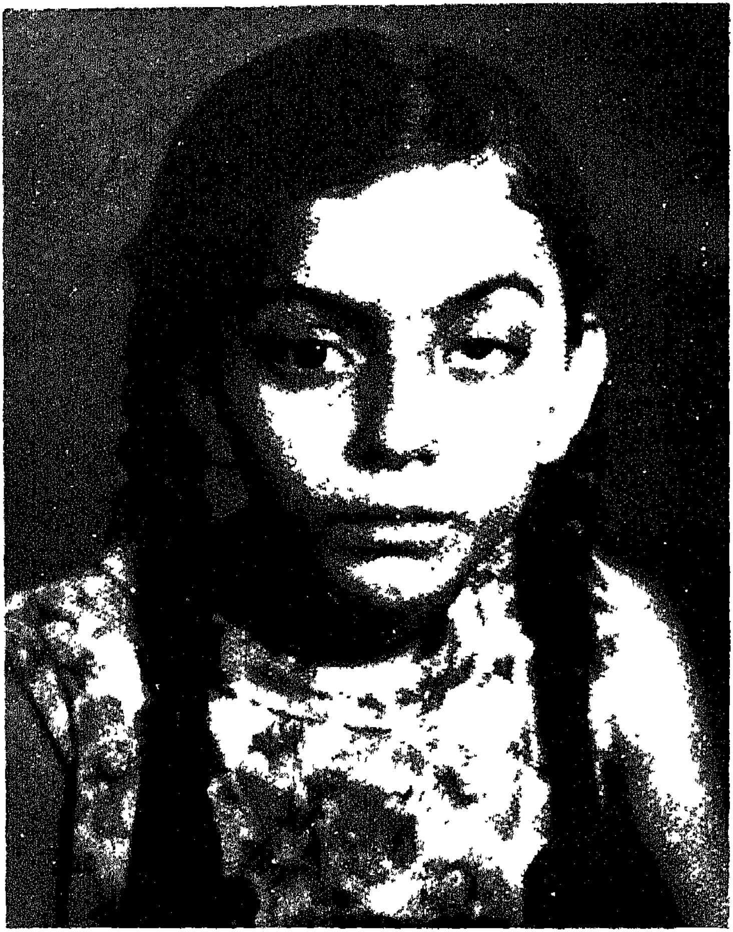
There is a great variety of diseases affecting the eyelids, description of all of which is beyond the scope of this book. However a number of the commoner conditions will be briefly described.

2.1. Stye

A boil in the eye lid is called a stye. Its site is on the margin of the lid either upper or lower and differs in no way from the ordinary boil in other parts of the body. It starts with pain most marked at one point on the lid margin. Soon there is a swelling and redness of the lid margin. Sometimes there may be swelling of the conjunctiva and swelling of the cheek also. It is very painful and takes about four to six days to subside with treatment. Sometimes it keeps on recurring and in that case it may either be due to poor health or living in poor hygienic conditions. You should treat it with hot fomentations three times a day and for medicine you should consult your doctor. It either subsides without bursting or pus may form which bursts out by itself or let out by the surgeon's knife. Neither the disease nor its operation has anything to do with eyesight. In recurrent styes good nourishing diet to improve the health should be taken.

2 2. Chalazion

It is a painless small circumscribed swelling in the lid about three to four mm. away from the lid margin. It is due to the collection of secretion of a gland present in the lid. If small it subsides with hot fomentations and massage of the lid. If big it needs an operation. This operation is just like opening a boil in any other part of the body and since it is done from inside the lid, one need not be afraid of a scar. If left alone, it may become quite big and may get infected. In



A patient of Ptosis.
Upper lid of left eye has drooped down.

[*See page 9*]

that case it becomes painful and there is swelling in the surrounding portion of the lid. Sometimes chalazions like styes keep on recurring, due to poor health or bad hygienic conditions. Neither the disease nor the operation has anything to do with the eye sight.

2.3. Blepharitis

It is an inflammation of the whole margin of the lid. It is usually accompanied by the formation of the white scales or crusts around the eye lashes. It is often associated with the dandruff (scales) of the head hair. The patient complains of itching, soarness and sensitivity to light (photophobia) The disease is common among children. For the head hair use a shampoo once or twice a week and pure coconut oil as a hair dressing. For blepharitis itself bathe the margin of the lid with cotton soaked in water. This will loosen the crusts and scales which are then removed. For medicines consult a doctor who will usually prescribe an ointment for it. This ointment has to be rubbed along the lid margin so that it goes to the root of the eye lashes, wherein lies the infection. There is no use of simply smearing the ointment on the lid margin Since it is an eye ointment there is no harm if it goes into the eye.

Sometimes during the course of this type of blepharitis small yellow boils appear at the roots of the eye lashes which burst and leave small wounds. This condition is more serious from the point of permanent loss of eye lashes and thus spoiling the beauty of the eye lids. Such state arises in three ways.

1. Undermining of health.

2. Frequent rubbing of lid margins, with dirty hands thus implanting harmful germs.

3. Living in bad hygienic surroundings where foul gas is constantly in the atmosphere.

All these are preventable. It has nothing to do with the eye sight.

2.4. Ptosis

It means drooping of the upper lid and may affect one or both eyes. It is usually present from birth and if it appears in later years of life the cause is usually due to some disease of nervous system the care of which is a primary concern. Ptosis may be partial or complete If partial it does not cover the pupil which is meant for the entry of light into the eye. If it is complete, it covers a large part of the cornea and pupil and does not allow the entry of light in the eye. Apart from the social handicap which is present in both degrees of ptosis, the complete variety interferes with the development of the vision which occurs during the first few years of life. If no steps for correction of complete ptosis are taken at an early age the eye sight is permanently defective. Therefore in all cases of ptosis consult your doctor who will first see whether the ptosis is interfering with vision or not. If it is interfering with vision, prompt measures have to be taken to rectify it There are only two ways of managing such a case. One is by use of a crutch spectacles and other by an operation. No amount of medicines or tonics are of any use. If the child is able to use spectacles let him use it and operation can be postponed to a later date according to convenience. But if he is not able to use crutch spectacles, operation must be done within the first two years of life for the development of the vision. A surgeon would always like to postpone the operation to a later date if it is possible without jeopardising the development of the vision because the operation is technically easier in an older child.

Sometimes ptosis may be associated with the defective upward movement of the eye-ball and this is due to lack of development of the upper muscle of the eye. This association has to be dealt with by a separate operation on the muscle itself. Ptosis when present from birth is usually due to heredity. Operation of ptosis is an operation on the lid and has nothing to do with the eye sight.

2.5. Entropian

It means inturning of lid margin and the commonest cause is Trachoma (*Kukre* or *Rohe*). Consequently the eye lashes rub against the cornea causing irritation, watering and redness of the eye. It is usually present in the upper lid, but rarely it may be present in the lower lid. Entropian of the lower lid is usually seen in old age and is due to the laxity of the skin of the lids. If not treated small wounds appear on the surface of the cornea which may become infected. When healed they leave permanent scars and loss of vision to a certain degree. A milder condition is called Trichiasis in which instead of the whole lid margin only few eye lashes turn inwards and cause the same effect. Both conditions are easily recognisable. You should consult your doctor as early as possible to prevent the formation of wounds in the cornea. Treatment of entropian is only by means of an operation. For trichiasis the eye lashes are pulled out by means of a forceps. They usually grow again in two to three months. The second method is to burn the roots of the lashes with electric current. The operation of entropian or use of electric current for trichiasis has nothing to do with eyesight. Neglect of both conditions can lead to certain degree of permanent loss of vision.

3

Red Eye

There are various causes of red eye. Some are serious from the point of view of vision and need immediate attention while others are not serious. These latter ones if neglected can also become serious. This chapter will deal with all the common causes of red eye.

3.1. Conjunctivitis

It means inflammation[1] of the conjunctiva. There is generalised redness of the eye, irritation, discomfort and discharge. It usually affects one eye first and after two or three days affects the other eye. After sleep when the patient gets up, the lids are stuck together by the discharge. In severe cases there may be swelling of the lids and the conjunctiva. It is due to some infection which has entered the eye either from your hand or towel, swimming bath, exposure to dust and smoke etc. There is no effect on the eye-sight.

3.2. Prevention

The following preventions should be taken.

1. Eye should be washed three times a day with a salt lotion (1 tea spoonful of common salt in 10 chhataniks of boiling water and used after cooling).
2. Hot fomentations should be applied three times a day.
3. Consult your doctor when convenient.
4. Do not touch your healthy eye with your fingers after having touched the diseased eye.
5. Sleep straight or on the side of diseased eye to prevent the flow of discharge into the healthy eye.

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[1] Inflammation means redness and swelling of a part of the body.

3.3. Phlyctenular Conjunctivitis

A small yellowish white nodule appears at some part of the limbus, usually at 9 or 3 o'clock[1] position. There is redness in the surrounding area. It is common in children and indicates that the general health is poor and he might be living in bad hygienic surrroundings. Usually the child has no complaint and the parents notice it. Sometimes the child rubs the eye due to irritation and may infect it. The condition then becomes associated with conjunctivitis. If neglected, the nodule encroaches upon the cornea and may interfere with eyesight. So long it does not invade the cornea, it has nothing to do with the eyesight.

3.4. Prevention and Treatment

1. Good nourishing food is necessary for weak children suffering from phlyctenular conjunctivitis.
2. Children should be prevented from rubbing the eyes.
3. Eye wash should be done three times a day.

3.5. Allergic Conjunctivitis

This condition is characterised by severe itching, watering, redness of the eyes and sensitivity to light. It may come on suddenly and may be associated with sneezing, running of the nose, eczema and asthma. There is no discharge and the eye lids are not glued together after sleep. It may last for several days and disappear automatically. It has nothing to do with eye sight.

3.6. Prevention and Treatment

Eye should be washed with cold water three times a day, and the doctor should be consulted for medicine. Avoid exposure to sunlight by dark glasses.

3.7. Spring Catarrh

This condition is common in children between the ages of 5 to 15 years. It is characterised by severe itching and a sticky discharge and sensitivity to light but the eye lids are not glued after sleep. It usually starts in the spring season and continues

[1] Imagine the black part of the eye as the surface dial of a watch.

to become worse during summer. In winter, the patient is usually comfortable. It keeps on recurring every summer but there is no effect on the eye sight. The disease either attacks the conjunctiva of the upper lid or the conjunctiva covering the white part of the eye or both. The former is technically called the Palpebral type and the latter is called the Bulbar type. In the former case, nothing abnormal is seen in the eye apparently but in the latter type there is redness of the eye usually localised near the limbus and there is a white gelatinous appearance near the limbus.

There is no permanent cure of the disease. The most annoying symptom is itching which can be easily relieved by medicines prescribed by your doctor. You should wash your eyes with cold water several times a day. It is almost impossible to restrain from rubbing the eyes to allay the itching. In that case you should cover your fingers with a clean handkerchief to prevent the infection. The cause of the condition is an allergy to some substance. If you are able to find out this in your diet or in the atmosphere; try to avoid it. Avoid exposure to sun by use of dark glasses.

3.8. Episcleritis and Scleritis

In this condition a small nodule appears on the white part of the eye usually on the outer side of the black part and few millimeters away from the limbus. Phlyctenular Conjunctivitis occurs right at the limbus. The nodule is surrounded by redness. Episcleritis in an inflammation of the outer part of the sclera and the scleritis is an inflammation of the inner part of the sclera. The former is not serious from the point of view of vision but takes a long time to disappear and sometimes recurs. It may turn into scleritis which is a serious condition from the point of view of vision. It is moderately painful and also takes a long time to disappear with treatment and may recur. The doctor will be able to differentiate between the two by internal examination of the eye.

It is caused by rheumatism, syphilis, tuberculosis, septic focus in teeth and tonsils and elswhere in the body, and sometimes without any discoverable cause.

3.9. Prevention

Try to maintain your inner cleanliness and your teeth clean. Consult a dentist when necessary. Overeating and irregular habits of eating cause indigestion and this in turn can lead to liver disorder and joint pains and a sick body. Syphilis is preventable and tuberculosis can be avoided by adequate diet and living in good hygienic conditions.

3.10. Iritis

It is an inflammation of the iris. Red eye due to this is a serious condition from the point of view of vision. The redness is more near the limbus and there is blurring of vision. There may be little or no watering and no discharge. There is lot of pain in the eye but can be with little pain. In most cases we still do not know as to why it happens. Known common causes are joint pains, syphilis, gonorrhoea, tuberculosis and septic focus in teeth, tonsils and elsewhere in the body. If any of these causes are known to exist in your body, do not hesitate to disclose it to your doctor. Sometimes the dentist advises the removal of teeth due to septic focus. It will be in your interest to get the bad teeth removed.

Do not neglect this red eye as it will start interfering with your vision from the very beginning. Unfortunately the condition recurs off and on and you should consult your doctor every time when it recurs. Prevention is the same as for Episcleritis and Scleritis.

3.11. Glaucoma

It is discussed later on.

3.12. Pterygium

In this condition conjunctiva without any known reason begins to move and encroach over the cornea and burrows into it. It almost always occurs on the inner part of the sclera. It starts at the limbus and proceeds slowly towards the centre of the cornea and if untreated may reach to the other end of the limbus. The redness is triangular in shape with base towards the inner corner of the eye. It may be white or pinkish in colour. Since it burrows into the cornea, it will definitely interfere with the eyesight. So long it does not reach the centre of the cornea *i.e.* in front of the pupil, any defect in vision is correctable with glasses. But once it comes in the pupillary area of cornea, it will have a permanent diminution of vision. Pterygium after growing into the cornea for a short distance may become stationary or grow further. More the redness, more are the chances for its growing. Exposure of the eye to dust and hot climate is a predisposing factor and hence it is more common in Northern and Western parts of India.

The only treatment is operation. After the operation a small white scar remains on the cornea permanently and it is for this reason that Pterygium should not be allowed to come to the centre of the cornea. Unfortunately even after a good operation, it may recur rarely and the remedy is to get it re-operated. If pterygium is stationary as indicated by its non-progress and white in colour, it is not essential to get it operated. No medicine can remove pterygium.

4

Trachoma (रोहे, कुकरे)

Trachoma is an infectious disease of the conjunctiva and spreads to the cornea. The disease is common in hot and dusty climate. If there are symptoms of irritation, watering and sensitivity to light you must consult a doctor to make sure that it may not be trachoma. These symptoms may also be present in allergic conjunctivitis as pointed out already. The disease is caused by a minute germ called virus which enters the eye by following methods.

4.1. Method of Infection

1. A patient may rub his eyes with fingers and then touch the eye of a healthy person.

2. The infected material from the eye passes down the lacrymal passages into the nose and on sneezing droplets of infected matter may be thrown into the eye of a person sitting close.

3. Use of towel and handkerchief of an infected individual by a healthy person.

4. Flies sit on the infected discharge present on the cheeks of a patient and then near the eye of another person.

5. At no period of life can one avoid shaking hands with people who have infectious trachoma and their fingers may be steeped with discharge. The constant possibility of infection is thus easily understood through fingers.

4·2. Course of Trachoma

Once the infection enters the eye it takes about four to ten days for the disease to begin. As the disease takes hold it takes one of the following several courses.

1. It may undergo a spontaneous cure without any treatment (a rare event).

2. It may pass through various stages called first, second, third and reach the fourth stage called the final stage.

4·3. Stages of Trachoma

During the first stage there may be no symptoms or slight irritation in the eyes. In the second stage the disease becomes more advanced and patient usually has irritation, watering, and sensitivity to light. The invasion of cornea is more in the second stage than in the first stage and the eye sight may be affected. Third stage is a stage of partial cure When a wound heals in another part of the body, a scar is formed. Similarly such scars also form in the conjunctiva of the upper lid and in the cornea. In the cornea scar is called an opacity and it interferes with vision. The process is not uniform in the conjunctiva and hence is called the stage of partial cure. The symptoms during this stage are milder than in the second stage. In the fourth stage there is scarring of whole of the conjunctiva in the upper lid and there is no further progress of the disease. Whatever disability has occurred remains permanent.

4·4. Recurrence in Trachoma

There are certain disases in general, which once cured, can recur like malaria, pneumonia, influenza, conjunctivitis and iritis. There are other diseases which do not recur during the rest of the life of the patient such as small-pox and measles. Both groups of diseases are due to an infection. In the second group certain protective substances are formed in the body during illness which protect it against the same infection subsequently. In the first group such substances are not formed. In the case of Trachoma no protective substances are formed and reinfection can occur in the first, second and third stages. In the fourth stage the whole of the conjunctiva is replaced by scar and no further infection occurs. Thus the fourth stage is the stage of cure but it is associated with some complications of the disease. It may have reached spontaneously or by treatment. There is no time limit of different stages but generally speaking with vigorous treatment stage two changes to stage three in two to three weeks time.

4·5. Causes of Blindness in Trachoma

1. In neglected second stage of trachoma cornea is invaded more and more by the disease process which starts

at the upper margin of the cornea and proceeds towards its centre which is the vital part for seeing. The black part of the eye appears white in colour. Permanent opacity of the cornea results leading to permanent loss of vision to a great degree. Patient still can see but does not possess a useful vision.

2. One of the complications of the disease is entropian in which eyelashes constantly rub against the cornea. The condition is already described.

3. Wounds (ulcers) may appear on the cornea due to disease process and if neglected they may get infected by other harmful germs and pus may form in the eye resulting in loss of vision.

4.6. Prevention of Trachoma

The subject of prevention is dealt with under the following headings.

4.6 1. Personal Prevention

Avoid rubbing the eyes with fingers. If there is itching sensation of the eye and if you rub the eyes with your fingers which may carry the trachoma germs or other type of germs, you will infect your eyes. You can avoid it by covering your fingers with your own clean handkerchief and then rub the eyes if you must.

4.6.2. Family Prevention

1. A trachomatus mother who takes no care of her eyes can infect the child by rubbing her eyes and then touching the child's eyes without cleaning. This should be avoided.

2. Handkerchiefs, towels and bed linens which have been used by trachomatous persons in the family can rapidly infect another person's eyes if they come in contact with the face. Its prevention lies in your hands.

3. Friends and servants with trachoma may infect a child when they handle him. Try to avoid it if you can.

4.6.3. National Prevention

The spread of trachoma is favoured by poverty, dust, bad housing conditions, deficient water supply and an excess number of flies. Therefore it is desirable to eradicate these factors which not only favour the spread of trachoma but a large number of other diseases.

For the treatment it is better for you to consult a doctor whose attempt is to stop the progress of the disease process and to hasten the formation of scars in the conjunctiva so as to make the disease quiet.

In trachoma minute multiple sago grain like pimples appear on the conjunctiva of the upper and lower lids. Such small pimples also occur in another condition called Follicular Conjunctivitis. This condition is absolutely harmless and requires no treatment. It subsides by itself. It may sometimes be associated with enlarged tonsils. Your medical attendant will be able to differentiate between the two by examination with a magnifying lens.

Trachoma is the greatest single cause of serious and progressive loss of sight often leading to blindness. According to World Health Organisation estimate one sixth of the world is affected—500 million compared with the figure of 10 million actually blind. Among these millions of trachoma sufferers children are the first victims. A survey in rural areas of Uttar Pradesh in India showed that under two years of age 4 out of every 10 were infected with trachoma. Among children above seven and among adults there were 8 trachoma sufferers out of every 10. The same is true of Punjab and Rajasthan.

The greatest single factor in the prevention of trachoma is improvement in standards of living and hygiene. In 1875, in England 80 % of children were infected with trachoma in poor Law Schools. By 1920 trachoma was wiped off even when no specific treatment was available then, no doubt as a result of improvement in standards of living and hygiene. In some subtropical countries the disease is becoming progressively milder due to improvements in hygiene and living.

5

Diseases of Cornea

Cornea as mentioned already is the most forward portion of the black part of the eye It is one of the vital parts of the eye in the mechanism of seeing because the rays of light have to first meet the cornea before entering the eye. There are a large number of diseases which affect the cornea and trachoma is the commonest Diseases of the conjunctiva if neglected may also invade the cornea. Generally speaking, transparency of the cornea is interfered with in three ways :

1. Infection from outside.
2. Spread of disease from the conjunctiva, sclera or iris.
3. Injuries of the eye.

Diseases of conjunctiva, sclera and iris have already been mentioned. Injuries will be discussed later.

5.1. Infection from outside

Normally tears contain an antiseptic substance which kills a large number of harmful germs if they happen to enter the eye from the fingers, flies or atmosphere. However it has no effect on the germs of trachoma. The cornea itself is a tough structure and is capable of resisting many harmful germs. Nature has provided protective mechanism to a part of the eye which is so exposed and is of great importance for vision. The infection takes hold in the cornea if the vitality is lowered when the normal defensive mechanisms of the body become weak. A white spot appears in the cornea and the patient knows it by watering, dimness of vision and sensitivity to light. Pain may or may not be there. Some redness appears round the limbus.

If these signs appear in your eye, you must consult your doctor as early as possible. The disease is called corneal, ulcer or Keratitis. In spite of the best treatment a permanent opacity may remain unless only the most superficial layers of the cornea is affected. If the opacity appears in the centre of cornea, it will interfere with the vision and if it is outside the central part, it will have no effect on vision. This opacity remains permanent just as a scar elsewhere in the body remains after healing of a wound. If it happens in a child and if not deep, it may slowly disappear in a year or so.

Opacity of the cornea not only interferes with the vision but it also spoils the beauty of the eye. There is an operation to remove this opacity but it is not yet popular in India. The operation is called corneal grafting and is discussed later. The opacity can be coloured to merge it with the rest of the appearance of the black part of the eye. This colouring will not improve the eyesight at all. The colouring however is not permanent always. Sometimes it fades off in a few years. Process of colouring is called tattooing.

5.2. Syphilis of the Cornea

Some children suffering from syphilis[1] transmitted to them from the parent may develop a serious disease of the cornea. Although the disease is present from birth yet its appearance in the cornea usually occurs between five to fifteen years of age. One or both eyes may be affected and it may come on so severely that the vision may be reduced to a great degree in a week or so. The cornea becomes white or pinkish white in appearance. A person suffering from syphilis must be careful about his child's eyes during the age period of five to fifteen years.

Whenever the disease appears, have it promptly attended. By proper treatment at an early age great deal of improvement can be achieved. Do not hide your illness from the doctor in the interest of your child. Even if you do not disclose, he will find it out by certain tests but it will mean delay in the treatment of your child. The disease of the cornea in medical terms is called Interstitial Keratitis.

5.3. Recurrent Ulcer of the Cornea

This is another serious disease of the cornea as it affects the vision. It is caused by a very minute germ called virus but it is different from the trachoma virus. There is again pain, watering, sensitivity to light and dimness of vision. In the cornea white spots appear which after healing leave permanent marks and thus interfere with the transparency of cornea. It takes a long time to heal and unfortunately tends to recur specially when the health is undermined. The disease is usually preceded by running of the nose and if during this period the patient develops small blisters on the lips, one can be almost certain that he is harbouring the germs of this disease. The patient should seek prompt treatment and improve the lost health by good nourishing food and rest. By taking such care he may possibly avoid the development of the disease but he is a source of infection to others. He should isolate himself from others as far as possible and should never kiss any body.

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[1] Syphilis called *Atshik* in Hindustani is a disease caused by illicit intercourse and is characterised by painless wounds on the private parts.

For prevention of recurrence, he should keep up his health and avoid injury to eye. If the eye has to be rubbed for the relief of itching he should try to avoid it or be gentle. In other words the eye is potentially weak. Avoid exposure to dust and smoke

5·4· Arcus Senilis

It is a condition in which a white ring appears in the cornea near the limbus. To start with it appears as a crescent at the upper and lower part of cornea and both the crescents then increase and meet each other. It does not proceed towards the centre of the cornea and hence never affects the eye sight It usually appears after the age of forty but rarely appears at younger age. This should not cause any worry at all. It cannot be removed by any medicine or operation.

6

Glaucoma (काला मोतिया)

By glaucoma we mean hardness of the eye. It is a serious disease from the point of view of vision. It is due to increased collection of watery fluid inside the eye ball due to some reason yet unknown adequately. There are two main types of glaucoma *i.e.* acute and chronic.

6.1. Acute Glaucoma

The disease is more common in females and occurs usually after the age of forty. People suffering from this disease have some abnormal feature in the eye partly in-born and partly developed after the age of forty. This abnormal feature alone cannot cause the disease and we have no prevention for that. There are some precipitating factors which can bring on an attack of glaucoma in such an eye. They are emotional disturbances, constipation, worry, sleeplessness, starvation etc. Sitting in the darkness of cinema house is another exciting factor. The disease may come on with or without warning signs.

6.1.1. Warning Signs

These are blurring of vision, discomfort or heaviness in the eyes, headache, slight redness of the eyes and the most important is the appearance of rainbow haloes around lights, that is to say that the patient sees a rainbow in the form of a circle surrounding the light. The attack lasts for a very short time and comes on repeatedly and the patient not realising its seriousness ignores it till a severe attack comes on suddenly.

6.1.2. Without warning signs

The attack of glaucoma comes on suddenly and it is characterised by severe pain in the eye, redness, marked diminution of vision and a feeling of sickness and vomiting. The pain spreads to the forehead and the patient is in great agony. Pain in iritis is within the eye. A similar type of attack can also come in an eye having a mature cataract Pain in the eye associated with redness, diminution of vision and vomiting in a person occurring after the age of forty should at once lead you to suspect acute glaucoma and medical advice should be sought immediately at the very earliest. It is an emergency and action should be taken in that sense. If the disease is not attended to, the pain would subside after some days but with permanent loss of some vision. A second attack may come at any time in the same way and by such repeated attacks eye becomes blind for ever. Even if you have taken prompt measures to control it by best treatment it is quite possible that some loss of vision may still remain. Greater the delay between the on-set of attack and treatment more the danger to vision. Before you are able to consult the doctor, hot fomentations may be applied to the eye. If you can recognise the warning signs mentioned before. consult your doctor during that stage. If treatment can be started during the stage of warning signs, eye can be saved from any loss of vision. If you have a mature cataract, get it operated as early as possible.

Treatment is by medicines and by operation. The first attempt is to control the disease by medicines. Usually the medicines are able to control the disease and the patient feels comfortable and the vision returns to a variable degree. But this is not the end of the treatment. The eye must be operated. If operation is not done, after sometime a second attack will occur with the same agony. Every attack carries away some degree of vision. Operation is technically easier during the quiet stage of the eye. If the medicines are not able to control the attack within twelve hours, operation has to be undertaken during the attack. Usually the patient remains in the hospital for seven days and in another two weeks the eye settles down. If the operation has been done during an attack uncontrolled by medicines, some recovery of vision occurs provided there was no mature cataract. If the operation was done during the quiet stage of the disease, whatever vision is present before the operation, is likely to remain after the operation. If the cause of glaucoma was mature cataract, no recovery of vision will take place after the operation of glaucoma. The second operation for removal of cataract will be done after three to four weeks when the patient will be able to see.

Usually when one eye has suffered from an attack of glaucoma, the second eye is also liable to be attacked. If the doctor advises an operation as a preventive measure the patient should submit to it even though there is nothing apparently wrong with this eye.

6.2. Chronic Glaucoma

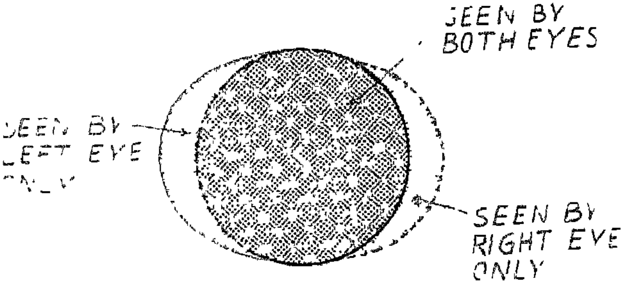
This type always comes on quietly and the disease may be well advanced before one is aware of it. It very slowly keeps on lowering the vision without the knowlege of the sufferer and may even cause blindness in one eye unless he has the opportunity to see his doctor for some defect in the eye. This loss of vision in one eye without the knowledge of the sufferer is due to the fact that mankind possesses binocular vision. (*See facing diagram*).

6.2.1. Binocular Vision

When we concentrate at an object with both eyes open, we not only see that object but also see in the surrounding area within a certain limit. This whole area is roughly circular in shape as shown in the diagram. The area surrounded by red circle belongs to the right eye and that bounded by green circle belongs to the left eye.

The central portion marked with dots belongs to both eyes while the two crescentic portions on either side belong to each eye separately. We seldom use these crescentic portions for our vision. Thus if one eye loses its vision gradually the patient continues to see without any diminution of vision with both eyes open. If the vision is lost suddenly in one eye then the individual becomes aware of this fact. This binocular vision although highly useful to mankind for purposes of depth and distant perception so essential in this highly civilised world has a disadvantage that an individual can lose the eye sight of one eye gradually without being aware of it.

In chronic glaucoma the field of vision of one eye keeps on contracting gradually from the outer side. The central part remains normal for a long time and ultimatlely the central part



Field of Vision

(See Page 26-27)

also is wiped off and the patient becomes virtually blind for ever in that eye.

6.2.2. How should you suspect it?

1. If any body in the family is suffering from glaucoma you should be conscious of it after the age of forty and consult your doctor off and on even if there are no symptoms.
2. Heaviness in the eyes.
3. Frequent change of reading glasses *i.e.* change within one year.
4. Headache coming on during and after sleep, after movies and during working in dim illumination.
5. While going downstairs you feel some blurring of vision.
6. While reading you miss some lines or words.

As the patient is not aware of the disease, it may not be possible also for the doctor to give a decision on first visit in the early stage of glaucoma. There are certain tests which he carries out in order to make up his mind whether the disease is present or not. He might keep you under observation for some time.

6.2.3. Treatment

Treatment of chronic glaucoma is by medicines, effect of which is to prevent a further loss of vision. Whatever loss of vision has already occurred it is usually not possible to regain it. The treatment by medicines has to be rigidly carried out throughout the rest of the life of the patient as in the case of diabetes. Irregular treatment may not control it. The rigid treatment consists of regular use of drops in the eye and frequent check up by a doctor.

If medicines fail to control it or if you are irregular in following the treatment, operation has to be done There is a rare type of chronic glaucoma which inspite of treatment either by medicines or operation continues to progress and ultimately ends in blindness. This is called low tension glaucoma. Fortunately it is rare. Even after the operation a regular check up of the patient is needed. Our surgical arts are not always successful here but on the other hand glaucoma left to its own devices means inevitable blindness.

6.3. Rules for Glaucoma Patients

1. Carefully follow your eye doctor's advice and remember to return for re-examination at the appointed time.

2. Consult him at once if you see rainbow haloes around light, if the eye becomes painful or vision is blurred.

3. Avoid excitement, anger, worry, fear or disappointment as far as possible.

4. Take care that bowel movements are regular.

5. If your occupation compels you to sit the entire day take a long but not too tiring a walk before and after work. This keeps your blood circulation active.

6. Limit drinking coffee or tea (not too strong) to one cup a day. Avoid alcohol.

7. Avoid dark rooms for long as movies. If you have to go to movies choose a picture not depressing or upsetting to you.

The above rules apply to a patient suffering from glaucoma. A healthy man need not live in such restrictions.

Glaucoma in children is discussed under the chapter of Young Eye.

Glaucoma can always be cured or arrested provided that it is diagnosed early and adequate and sustained treatment is given. In general treatment cannot produce results in a few hours or few months. When successful it simply stops further deterioration of sight. Sometimes the patient may even have the impression that he sees less well than before and often fails to continue the treatment, until the day comes when blindness can no longer be prevented by any known means. Do not be misled by this false impression.

7

Cataract (सफेद मोतिया)

7.1. General Information

Cataract means opacity in the lens of the eye. As the rays of light have to pass through the lens, its transparency is essential for good vision The lens is a disc like structure about the size of a small button. Its central part is concerned with vision. The outer part is not concerned with vision. Any opacity in the outer part does not interfere with vision.

Cataract may occur spontaneously after the age of 40 or it may occur due to some disease of the eye or some general disease. Diseases of the eye which may be complicated by cataract are iritis, disease of the choroid (choroiditis), high myopia (high minus glasses), detachment of retina, retinitis pigmentosa (cause of night blindness). Removal of cataract due to these conditions is a complicated procedure and the recovery of vision is poor because of the underlying disease. General diseases causing cataract are diabetes and tetany (disease due to lack of calcium) and few other rare conditions.

Majority of cases of cataract occur after the age of forty and we still do not know its cause. Symptoms of cataract are gradual diminution of vision, coloured rays of light radiating from the lamp. and seeing double or treble with one eye. As the opacity increases, the vision becomes less and less. If the opacity is in the centre of lens, patient sees better in shade or after sunset than in the sun. This is due to the fact that in the sun or light, pupil becomes small and large number of rays of light after entering the small pupil are prevented by the central opacity of the lens. In shade pupil becomes larger and rays of light are able to bypass the opacity and reach the retina. Such patients can see better in day light with dark glasses.

It is not possible to state definitely the time for the cataract to mature. Sometimes few opacities appear and may remain stationary throughout the life. There is no medicine which can remove the opacities. Treatment is always by operation in which the opaque lens is removed from the eye. Cataract may come in one eye or both eyes simultaneously or independently.

About ten years ago it was a general opinion that cataract should be operated when it is mature *i.e.* when the patient cannot see at all. Now with the improved technique in surgery, operation can be undertaken at a time when the patient becomes visually handicapped in the daily routine of life even if he can see.

If there is cataract in one eye and the other eye is normal its operation should be done when it becomes mature. Here the operation is done for the following reasons.

1. If mature cataract is left to itself, attack of glaucoma may come on.

2. Cataract may become hypermature and may spontaneously fall back into the vitreous cavity resulting in loss of vision after some time.

3. Patient cannot use the operated eye with glasses on along with the healthy eye because of great disparity between the glasses of two eyes. But without any glass on this eye or with plane glass, he gets some field of vision to the side of the operated eye.

When the cataract becomes mature patient cannot see any thing but one thing he should see *i.e.* ability to differentiate between light and darkness. Not only that, he should also be able to say from which direction the light is coming. If these two points are present, one can reasonably think that the patient's retina and optic nerve are healthy and he will have good vision if everything goes well in the operation. Cataract operation is done under local anæsthesia and the patient remains conscious throughout the operation. Some co-operation of the patient is required during and after the operation.

7.2. Patient's contribution to the success of the Operation.

A patient for operation of cataract is admitted in the hospital one or two days before the operation. He should tell his doctor if he is suffering from any disease like cough, asthma, indigestion, heart trouble, urinary trouble, itching, diabetes etc. In fact whatever disease he has in the body he should disclose it. Some investigations are done before the operation to know whether he is suffering from any disease which may jeopardise the operation. Ladies should wash their hair and shampoo because this opportunity will not be available for at least fifteen days after the operation. Men should shave and have hair cut for the same reason. Before the operation the patient is given a purgative or enema or both to clear the bowels. He is given a drug which makes him sleep at night and allays the apprehension of operation.

During the operation he should not move the eyes unless asked for. He should keep lying still and close the other eye as in sleep. After the operation both eyes are bandaged and he is transferred to the bed. While transfering, patient should not move himself nor help the attendants. He should relax completely. While lying in the bed, he should keep quiet for three to four hours. Thereafter he may be moved to one side if the doctor permits. During night a sleeping dose may be given. Next day bandage is opened and the eye is dressed. The other eye is left open. If the patient feels to sneeze, he can check it up by putting two fingers on the upper lip and press hard against the teeth. He should also press his tongue against the roof of his mouth. This simple trick may abort sneezing provided it is done at the earliest when feeling of sneezing comes. If he has to cough, he should do so by widely opening the mouth instead of suppressing it or coughing by closed mouth. If sneezing has to come, let it come on with widely open mouth. By doing so less exertion occurs on the body.

The diet for first forty eight hours is liquid like milk and fruit juices. After forty eight hours semisolid food is given for three days. Thereafter solid soft food is given. There is no restriction to any eatables.

The patient is out of the hospital in seven to ten days time. The bandage is removed and a green shade is given. He should take rest at home for a fortnight and should use the medicine prescribed by the doctor. He is called by his doctor later for check up. While moving between the hospital and home, transport should be such that there are no jolts and jerks because they are liable to cause bleeding in the eye. The blood usually absorbs in few days time in most cases but it has a bad psychological effect on the patient when his vision becomes blurred suddenly after discharge from the hospital and the surgeon also does not like to see it. It will prolong the recovery period and occasionally may completely spoil a good result. He may be readmitted in the hospital.

Patient can smoke and drink and take his dose of opium in moderate amount if he is an addict. Smoke should not go into the eyes.

After about a month and a half glasses are prescribed. Without glasses patient can only count fingers at a distance of about a meter. Glasses improve the vision. Cataract glasses have a high plus number *i.e.* round about ten for distance and about thirteen for near work. If patient has normal vision or made normal with glasses in the better eye, he cannot use cataract glasses in the operated eye, because he will see double (diplopia). This is due to the fact that image seen by the operated eye is much bigger than the image seen by the healthy eye. Brain cannot fuse these two widely dissimilar images. Under such circumstances either no glass is required or plane glass on the operated eye if glasses are used for the healthy eye. For the exercise of vision of the operated eye, patient should use glasses on the operated eye with a ground glass on the healthy for two to three hours at home. By doing so patient will remain in confidence that his operated eye can see well and can utilize it if by any chance healthy eye becomes diseased. The ground glass on the healthy eye will prevent double vision.

Some patients do not have double vision when wearing glasses on the operated eye without a ground glass on the healthy eye. They use one eye at a time and do not have double vision. They can use any suitable glass on the healthy eye and properly numbered glass on the operated eye.

If the vision in the unoperated eye is much less even with glasses than the vision of the operated eye with glasses, double vision will not occur and there is no necessity of using a ground glass on the unoperated eye. A plane or numbered glass may be used. Glasses for near work for the operated eye are separate.

Patient cannot see his near work with distant glasses. Both the distant and the near glasses can be combined to form a bifocal but many patients find difficulty with such glasses on account of high number. However one could obtain such bifocal glasses and start using them and try to overcome the difficulties in the initial stage. Once he is able to adjust himself to the bifocals. he will be a happy person with vision at all distances without the botheration of changing the glasses.

An operated eye is a vulnerable eye and should receive special care for the rest of life. Any onset of disease in this eye should be looked after promptly. The eye should not be rubbed hard if there is itching.

Sometimes patients see every thing red or blue by the operated eye. One should not worry about it. It is due to some light phenomenon not well understood but disappears in a few weeks time by itself. It should be ignored.

8

Watering of Eyes

Watering from the eyes is a common symptom and is due to various causes. As already pointed out the lacrymal gland secrets a watery fluid which passes over the surface of the eye towards the inner corner. From here it passes through the Puncta sac and naso-lacrymal duct in the nose. Watering is obviously due to either excessive production of fluid from the lacrymal gland or defective drainage mechanism in the lacrymal apparatus.

8.1. Causes

Excessive secretion is commonly caused by defective vision, weakness of the muscles of the eyes. diseases of conjunctiva and cornea and their irritation by some foreign matter, smoke and exposure to strong winds. If the cause is defective vision or weakness of muscles, watering is more when doing some near work as reading, knitting etc. Treatment is to remove the cause.

Sometimes watering is due to some block in the drainage apparatus of tears and this block may be due to old trachoma, recurrent cold or chronic inflammation of the passages. Treatment for this cause is to clear the passage by syringing water into the passage and force out the block. This is a simple procedure and one should not be afraid to get it done.

A rare cause of watering is a condition in which the lower lid sags away from the eye-ball. Consequently the punctum is not in contact with the eye ball. This happens usually in very old people having loose skin and muscle. Treatment of the condition is by operation which has nothing to do with eye sight.

Sometimes the lacrymal sac becomes dilated due to the stagnation of fluid. A painless swelling appears between the inner corner of the eye and bridge of the nose. On pressing it water or discharge comes out through the punctum or sometimes it goes into the nose. This regurgitated fluid contains harmful germs which normally are killed by the antiseptic substance naturally present in the tears. If there is even slight injury to the eye or vitality of the patient is lowered a severe ulcer of the cornea appears which even when well treated will result in some loss of vision due to resulting opacity of cornea.

The swelling sometimes becomes converted into an abscess with pain and redness. If neglected it will burst open with the relief of pain but leaving an ever present discharging hole.

Whatever be the cause, watering by itself does not cause defective eye sight except when ulcer of the cornea occurs as mentioned above, but it is an annoying symptom and a social hadicap.

8.2. Treatment

Treatment of the dilated sac is only by operation. This operation is done either under local or general anæsthesia and has nothing to do with eye sight. Even after the operation sometimes little watering may occur specially when exposed to strong winds.

8.3. Prevention

1. Prompt treatment of any cold in the nose so that it may not become chronic. Chronic cold blocks the naso-lacrymal duct.
2. Eyes should be protected from dust and smoke etc., so as to avoid excessive watering of the eyes. Treatment of watering in the early stage may be easy and simple. Neglected watering may need operation.
3. The operation should be undertaken at the earliest because there is always the ever present danger to the cornea resulting in some degree of loss of vision or occasionally loss of an eye.
4. The eyes should not be wiped by dirty hands but by clean handkerchief.

It is common belief that if there is a death in a family, mourning for a long time spoils the eyes. Rightly it can do in two ways.

(*i*) Emotional disturbances can precipitate an attack of glaucoma in a predisposed eye after the age of forty.

(*ii*) Frequent wiping of eyes with dirty hands can introduce an infection in the eyes and can cause conjunctivitis. Cataract does not occur as commonly believed.

9

The Young Eye

9.1. Growth of an Infant's Eye

Children depend on adults. Parents may do as they please about their own eyes but they cannot neglect the eyes of their children. Infants are born with eyes that cannot see. During the first few days of life they are attracted towards the light. In the first six months of life the eyes move aimlessly. After that the two eyes move symmetrically Colour vision also develops when the child is about a year and a half. A child is born with blue eyes. This changes to brown in the majority of the eyes during the first year. It is during the early growing years that the child's eyes require the most careful attention. Bad visual habits, defective eye sight and diseases that are neglected may leave their permanent mark on the whole life of the future adult. It is interesting to know the manner of development of the eyes of an infant from the point of view of movement and vision.

At birth : Aimless movement of the eyes.

At two weeks : The two eyes move symmetrically and equally when a torch is made to approach towards the eyes but this movement is for a very short time and again the eyes move aimlessly.

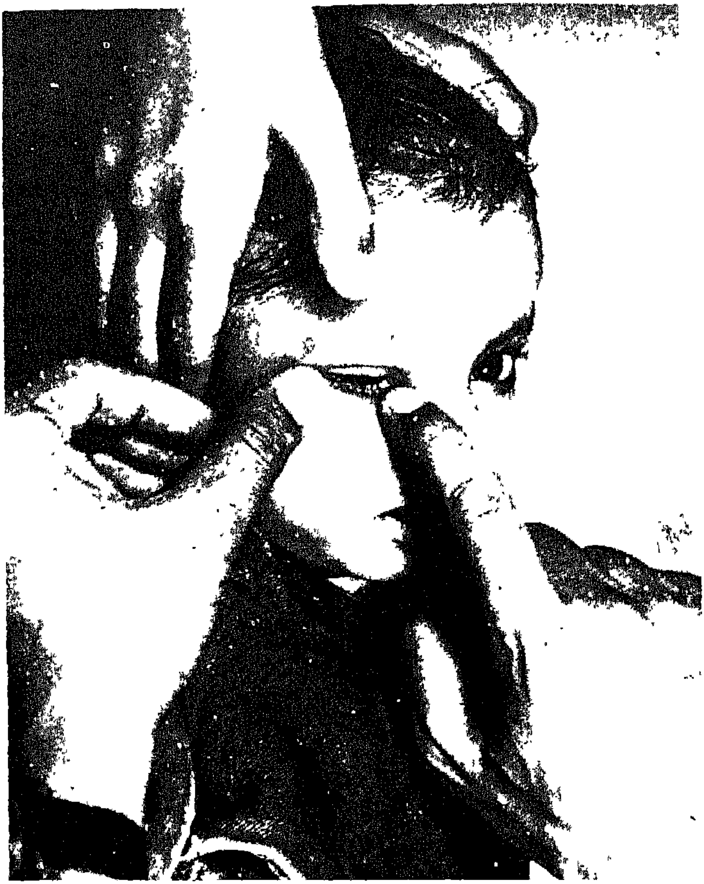
At 5 to 6 weeks : Stares at large objects.

At 2 months : Eyes follow a person or a hand.

At 3 months : Eye and head both follow a moving object.

At 4 months : Holds the head up, inspects own hand, tries to catch an object with hand.

At 6 months : Head and eyes follow a moving object and the body also moves to the extent of sitting up. Keeps his eyes turned in on an object brought near to him.



Method of pressing the tear bag in an infant having watering from right eye since birth.

[*See page 37*]

At 12 months : Attempts erect posture.
At 13 months : Points to his nose, head and eyes.
At 2 years : Vision 6/12.
At 3 years : Vision 6/9.
At 5 years : Vision 6/6.

As the eyes develop and vision improves the child's mental and fusion faculties also develop. These faculties are one of the important features to hold the two eyes in parallelism. These faculties during the developmental stage are weak and can be easily overcome by certain factors and the squint may start. These factors are refractive errors, illness and injury to the head. The fusion faculty is well developed by the 8th year of life and the squint of a nonparalytic type after this age is rare.

Below is a description of some of the diseases which are peculiar to infants and children.

9.2. Watering of the Eyes

At birth there are no tears from the eye of an infant because the lacrymal gland does not start functioning for 3 to 4 weeks. The eyes are kept moist by the secretion of the conjunctiva. After 3 weeks the lacrymal gland begins to secrete tears which after moistening the eye drain into the nose by the lacrymal passage. The lacrymal passage is not canalised or is not patent at first. It usually becomes patent just before birth. In some cases it remains closed at birth and becomes patent after a variable length of time usually within 6 months. Under such circumstances there is watering and discharge from the eye. Parents get worried about this watering and discharge in a new born infant and fear that if not treated it might affect the eye sight and cause squint. This impression is not at all correct

9.2.1. Treatment

1. Put the baby in the bed.

2. Put your left thumb below the outer part of the lower lid of right eye and pull it outwards so as to make the lower lid tense.

3. Put the tip of your right forefinger between the nose and the corner of the eye and press it backwards and downwards.

This procedure should be done 3 to 4 times a day. It expels the collected discharge.

4. Consult your doctor who would probably advise some drops.

Reverse the hands for the left eye The above procedure should be continued till the watering stops. If the condition does not subside by the 6th month of age or if the parents have no patience, the passages can be opened by a probe. It should be done by an experienced eye specialist as the procedure is delicate. It is not a cutting operation. It can be done without any anæsthesia or under general anæsthesia. The procedure has nothing to do with the eye sight.

9·3. Cataract

Every one knows that cataract is quite a common disease in old age. All do not know that new born infants and children can also develop cataract. A baby may be born with a cataract and usually both eyes are affected. It may be mature but usually it is immature. This immature cataract may remain stationary or progress to maturity.

9.3.1. Cause

The cataract from birth is either hereditary or more commonly due to some defect in the stage of development of the baby inside the womb. This defect is probably due to some deficiency in the nutrition of the mother during pregnancy. The third cause is German measles occurring during the first 2 to 3 months of pregnancy. The chances of development of cataract in the newly born infant of such a mother are so great that in U.S.A. the occurrence of German measles in the pregnant mother during the first 2 months has been considered an indication for legal abortion. The incidence of cataract gets less after the seconnd month of pregnancy.

9.3.2. Prevention

1. Mothers should be given adequate diet during pregnancy. This adequate diet includes plenty of calcium, iron, vitamins and other mineral salts. One seer of milk, fruits and green vegetables apart from the normal diet will be sufficient for the growth of the baby in the womb.

2. The pregnant woman should avoid contact with a case of German measels. Before marriage young girls may be exposed to German measles because this disease does not recur.

9.3.3. Management of Cataract

There are only two ways to treat cataract :

1. Operation
2. Leave it alone.

If the distant vision is 6/18 or better necessity for operation does not arise because this vision is sufficient for reading and other purposes. If the vision is 6/24 or less and he has difficulty in his reading, the case must be operated. In other words the main deciding factor is the disability of the patient. Since he is a child, the main object is his education and the disability should be viewed in this light. It has also to be viewed in another aspect. A patient after operation needs high numbered glasses *i.e.* +10 or more and he needs also two separate glasses for reading and distance. It becomes cumbersome for a child to manage the two pairs of glasses, although some may find easy to wear bifocals.

9.3.4. Time of Operation

The operation when decided is not usually done before 9 months of age. The only indication for an earlier operation is when the patient is developing nystagmus *i.e.* oscillation of eyes. This condition develops when the child cannot see at all.

Operation is done under general anæsthesia and the technique is quite different from that in adult. The name of the operation is Needling. The cataract is not removed from the eye as in adult but its covering membrane is broken so that the fluid inside the eye dissolves the opaque lens. The patient does not get the vision so early as after operation in old age. The absorbtion of the opaque lens occurs in 2 to 3 weeks. Sometimes the operation is repeated at an interval of 3 to 4 weeks. The child after the operation need not be confined to bed as an old man. The only precaution is that the child should not rub his eye over the bandage. He is discharged after one or two days of the operation and the parents continue to apply the medicine at home.

When a child suffers from cataract, usually there is some defect in his teeth also. It is therefore advisable to consult a dentist also.

Apart from the above type of cataract with visual disability there are various other types of cataracts which are also present from birth. They usually do not cause any disturbance in vision and remain stationary throughout the life. You need not be alarmed if on routine examination your doctor informs you of this type of cataract.

9.4. Opacities of Cornea

Opacity of the cornea in a new born infant is either due to difficult delivery or syphilis in the parents or without any known cause. In many cases the opacity clears in some months, mainly automatically and partly supported by the treatment prescribed by the eye specialist.

9.5. Infantile Glaucoma (Buphthalmos)

This is a type of glaucoma which appears in a new born infant or in childhood. It is a rare but an unfortunate condition because in spite of treatment the condition sometimes deteriorates and secondly the parents become aware of it after some permanent damage has occurred. It is therefore important to recognise this condition as early as possible.

9.5.1. Signs of the Disease

1. The eyes are unusually big specially the cornea. There is a different condition in which the cornea from the birth are unusually big and is harmless. In this condition other following signs will be absent.

2. Child does not tolerate light and likes to keep his head away from light.

3. A white line or dot may be seen in the cornea.

The above signs should lead you to suspect infantile glaucoma and you should consult your doctor. Treatment is at first by medicines and if not successful, by operation. The operation may have to be repeated more than once and the child has to be checked periodically.

9.6. Conjunctivitis of the New-born

Any conjunctivitis in a new-born baby has to be viewed seriously. Neglect of this condition may perpetuate the conditions of darkness in the womb even in the world of light. This conjunctivitis is usually due to some infection during the birth. If the infection is of gonorrhoea it is of the worse type You should at once consult the doctor for prompt treatment of the disease.

9.6.1. Prevention

1. Every pregnant mother suffering from any discharge from the birth canal should have herself treated by a doctor till she is cured.

2. After the birth of the baby the eyes should be cleaned by two separate cotton pieces.

3. The first bath water should not be allowed to get into eyes.

4. A drop of one per cent of silver nitrate is dropped in each eye.

The above precautions have reduced to a great deal the incidence of blindness in children due to conjunctivitis.

Any one opening the eyes of an infant or even of an adult full of pus should wear protective goggles to prevent the discharge spurting into the eyes. They should wash their hands with soap and water and should never touch their eyes with dirty hands. If per chance the discharge spurts into the eye, it should be immediately washed and penicillin drops should be put frequently in consultation with a doctor.

9.7. White Pupil

Normally the pupil of a child is jet black. If it appears to be whitish or yellowish you must consult a doctor very soon.

Causes of the white pupil are :—

1. Tumour inside the eye.
2. Cataract.
3. Severe Iritis.

If it is a tumour of the eye, the eye has to be removed as early as possible. If it is neglected, the tumour will grow and come out of the eye and will also go back into the brain. The operation when undertaken after the tumour has come out of the eye results in a bad deformity on the face. If it has invaded the brain the child is bound to die sooner or later.

10

Injuries of the Eye

Injuries of the eyes are not only common in warfare but also among workers in certain industries and public in general. They are of far reaching importance on account of loss of working capacity and permanent visual disability. The eye-ball is well protected by the bony socket and by the eye lids. Blinking and protective action of eye lashes often prevent the entry of foreign bodies into the eye. In spite of these natural protective mechanisms eye ball suffers from a large variety of injuries.

10.1. Black Eye

Blunt injury to the eye lids may cause bleeding inside them which become swollen and they assume black colour. Blood is absorbed in a few days time. The condition by itself is not at *all serious but examination of the eye is essential to exclude* any injury to the inside of the eye ball. You should apply cold fomentations in the first 24 hours and thereafter hot fomentations.

10.2. Bleeding in the Conjunctiva

This may happen due to blunt injury to the eyes and appears like a brick red patch covering the white part of the eye. This also disappears in a few days time automatically. Bleeding in the conjunctiva may also appear in a child suffering from whooping cough. There is no effect on vision.

10.3. Burns of Eye Lids

Burns of eye lids whether from fire, caustics or radiation may cause great disfigurement after they heal. The lids may become shortened and may not cover eye balls resulting into injury to the cornea and visual disability. Proper treatment taken from the beginning may prevent all these complications.

10.3.1. Burns by Lime

If lime enters into the eye it causes a great deal of damage to the cornea. The eye should be immediately washed and any white particle of lime should be removed immediately by a handkerchief. This is extremely important because if left for sometime before a doctor is consulted it can cause an irreparable damage.

10.4. Foreign Bodies

Foreign bodies in the eye constitute one of the commonest of all eye injuries and emergencies. They are a potential cause of serious damage to the eye and their prompt recognition and removal is a matter of urgency.

10.4.1. Foreign Body in the Conjunctiva

Foreign bodies in the conjunctiva usually become fixed on the inner surface of upper eye lid. In each movement of the upper eye lid as in blinking the foreign body rubs against the sensitive cornea and may cause fine injury. There is a great deal of discomfort, redness and watering. The eye lid should be everted and the foreign body should be wiped off by clean handkerchief. Method of everting lid is given later.

10.4 2. Foreign Body in the Cornea

Cornea is very sensitive and any foreign body over it causes a great deal of pain in the eye. If left for a few days it may cause permanent opacity. If infected, pus may form inside the eye and it may be totally lost. It will be a great pity if an eye is lost by the neglect of a minute foreign body. I have seen such a case.

10.4.3. Foreign body Inside the Eye

A foreign body may strike the eye with such a momentum as to pierce the coverings of the eye ball and enter inside it. Such incidence occurs in those labourers who break stones or who work on hammer and chisel. There are three dangers of a foreign body inside the eye.

1. The foreign body may injure those parts of the eye which are concerned with vision.

2. It may be infected and cause pus formation in the eye.

3. It may lie in an area of the eye which is not directly concerned with vision. It may start its own irritation which spreads to other vital areas and affect the vision at a later date to the extent of complete loss.

Some of the foreign bodies like glass, lead, gold, silver, aluminium are harmless and may remain in the eye for years without giving trouble. But other materials like iron, steel, copper and wood may cause reaction which may entirely destroy the eye.

10.4.4. Prevention

Protective goggles must always be worn when breaking stones and working on hammer and chisel. Goggles must also be worn while driving a motor-cycle. If a foreign body happens to enter your eye but not inside the eye ball, you should act as follows :

1. Do not rub the eye.
2. Blink frequently so as to dislodge the particle from its position in the hope that it will be washed out by the tears.
3. If unsuccessful, dip the eye in water and blink frequently.
4. If still there is no relief, warm your handkerchief with your breath and put it over the closed eye lids. This mild heat soothes your eye.
5. Consult your doctor. The doctor removes the foreign body and bandages the eye for a day after which the patient is allright.

10.5. Occupational Injuries

The majority of occupational injuries can be avoided by wearing special masks or protective goggles of unsplinterable glass. The employer should see that they are provided for their employees and should insist that they are worn.

Following steps should be taken to maintain the eye protection programme at high standard in a factory.

1. Examination of the eyes should be done for all new employees in the factory. Only people with normal or corrected

vision should be employed. If people with defective eye sight are employed, they are more prone to accidents.

2. It is also important to detect the colour blindness and night blindness in workers.

3. Periodic examination of the eyes of the workers should be done and a record maintained.

4. First-Aid appliances and ambulance or other transport should be maintained in an efficient state. Sufficient number of workers should be trained in first aid work.

5. Education of the workers by talks, leaflets and personal advice concerning the risk of eye injuries and the precautions necessary to avoid them should be given.

6. Factories should be properly illuminated because defective illumination causes eye strain. It is responsible for the automatic movements of the eyes—a disease called Coal Miner's Nystagmus and also may influence the progress of myopia. Glare and shadows are also responsible for eye strains and consequently diminished output in factories. Defective illumination is the indirect cause of accidents.

7. The goggles and the other protective equipment should be chosen with respect to particular hazards of the job. They should be accurately fitted to the workers.

8. Provide a case for the goggles and a suitable place where the goggles can be kept clean and safe when not in use.

9. All the goggles should be regularly reconditioned.

10. Provide tissue paper and cleansing fluid at convenient places throughout the factory so that sweat, grease and dust can be cleaned from the lenses. A man will not use goggles if he cannot see through them.

11. Provide numbered lenses in goggles when the worker's eyes need correction.

12. Provide antifogging substances for the lenses where working conditions cause them to be fogged.

13. Provide sweat bands to be worn around the forehead where working conditions cause men to perspire freely and thus cloud lenses. Suitable transparent face masks which cover the whole face should be worn by workers dealing with chemicals like

acids and alkalies. These chemicals can lead to hideous deformities of face. In the eyes they can cause irreparable damage

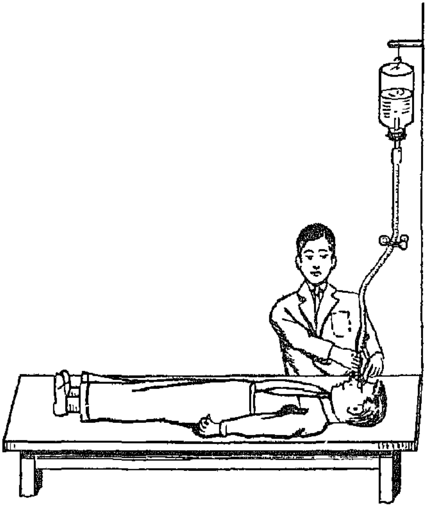


Fig. 10 1—Diagram showing how to wash the eyes.

and of acids and alkalies latter are more damaging. If per chance they happen to enter the eyes, wash them immediately with water. For this clean sterile water at a convenient place where a worker can rush atonce should be provided. The above diagram shows a simple method of keeping sterile water for this purpose. After liberally washing the injured eye, patient should be rushed to the hospital as an emergency.

10.6. Agricultural Injuries

In India most of the population belongs to agricultural class. Injuries due to blows from cattle, chopping wood, hedge cutting, hanging branches of trees, loading of corns in carts and thrashing of corns can be very serious. These injuries should never be taken lightly. A specialist should be consulted immediately.

10.7. Blunt Non-perforating Injuries of Eye

A severe blow on the eye by a blunt object such as a tennis ball, a shuttle cock or a stone may injure the eye causing visual defect of a varying degree There might be bleeding inside the eye, rupture of the eye ball, splitting of retina, swelling of the retina etc. All these conditions are serious and you should consult your doctor as soon as possible. If there is only bleeding inside the eye, blood usually gets absorbed in several days and vision may fully recover. If there is a severe swelling of the retina (commotio Retinae) some permanant loss of vision occurs. If the swelling is moderate full recovery of the vision is likely to occur.

10.8. Perforating Injuries of Eye

Such injury may be caused by a sharp object like wire, scissors, knife, bow and arrow, sharp stick etc. They cause such a severe injury that total or partial loss of vision is the usual result. Not only that even the other eye is sometimes in danger. The condition in the other eye is called sympathetic ophthalmia. It means that the second eye sheds tears and mourns the sufferings of the injured eye. This condition is more likely to occur if the perforating injury by a sharp object is near the limbus of the eye. You should consult your doctor as early as possible for the treatment of the injured eye. The doctor treats the injured eye and if the eye is not responding to the treatment, chances of involvement of the second eye are great. It has been noticed that if the injured eye does not settle down in two to three weeks time and if it has no vision the eye is removed as a measure of safegaurd for the second eye. If the patient is discharged after treatment of the injured eye without its removal the patient is advised to see the doctor periodically for the examination of the injured eye and the second eye. If you notice the following signs in the second eye you must at once consult your doctor.

1. Watering of the eye.
2. Slight redness not present before.
3. Difficulty in focussing the letters while reading.

4. Blurring of vision.

5. Slight pain in the eye.

These are the early signs of sympathetic ophthalmia. Treatment at an early stage might abort the disease but once the disease gets hold in the eye it is liable to lose permanently a great deal of vision. It has been an experience that sometimes the second eye is so badly affected that it loses its total sight while injured eye retains some degree of vision. It is therefore of utmost importance that any perforating injury of the eye should be under the care of an expert eye specialist and the patient should be on his guard to watch any symptoms in the second eye.

I have seen the following types of injuries in my practice :—

1. A child hit another child's eye with an arrow while playing with bow and arrow.

2. A child was playing with a bow and arrow held in opposite way and when he released the bow the arrow went into his eye instead of going away from him. The arrow pierced the eye ball and the eye was lost.

3. A child while playing with a toy-gun released the pellet which struck the eye of another child.

4. A child was standing behind her mother who was sitting and stitching some clothes. The mother after removing the needle from the cloth drew the thread and in order to do so she extended her hand holding the needle upward and backward. The needle at once pierced the eye ball of the child who was standing behind her.

5. While playing '*Gulli Danda*' a child hit *gulli* with a great force at random and it struck the eye of a man passing nearby.

6. A child threw his *gulli* by his stick from the ditch in the ground and his friend stood behind him. The stick injured the eye of the child standing behind with a great force.

7. A person was bending a wire which got accidentally released from the hands and its point struck his eye. It could strike another person's eye sitting near him.

8. A Deepawali cracker struck a man's eye.

9. Two children fought over a small piece of reed and one of them struck it into the eye of another.

10. Bending of a piece of broom-stick and then suddenly releasing it struck the eye of a child.

11. Two children quarrelled with each other and one of them had big nails which ruptured the eye ball of the other child.

It is a pity that most of the above types of injuries resulted into almost total blindness, more so when many of the above types of the injuries are preventable. I appeal to the public and to the government that bow and arrow, toy-guns with pellets and *Gulli Danda* and Deepawali crackers should be banned.

In conclusion I would advise that any injury to the eye should be reported to an expert eye specialist at the earliest.

10.9. Sun Eclipse, Injury of Eye

When a person looks at an eclipse of the sun without dark protecting glasses or with inadequately darkened glasses, burn of the retina occurs. The degree of burn depends on the duration of exposure of the eye to the solar eclipse. It also occurs when looking at the sun through a telescope or when gazing at the sun's reflection in a mirror.

In the very mildest cases, after a quick look at the sun an after-image of the sun occurs which disappears after a while. No permanent injury of the retina occurs. In moderate and severe cases, a black spot appears in front of his eye. This black spot lasts for two to three weeks and then it disappears. The vision of the person is permanently lowered to a varying degree. Also the linear objects appear zig-zag and a line in the book appears wavy. Sometimes pain, watering and redness of eye may occur. They subside in a few days.

10.9.1. Prevention and Treatment

1. Protective dark glasses should be worn while looking at the sun during an eclipse. Only a glass of such a dark colour, that when looking through it at the sun, there are no after-images, gives adequate protection.

2. If you have exposed your eyes to a sun eclipse, without glasses, immediately give rest to the eyes. Sit down comfortably and cover both eyes with the hollow of your palms avoiding any

pressure on the eyes. Close the eyes lightly and think of darkness. Do it for 15 minutes. Thereafter wash your eyes with cold water. Wear dark glasses and take rest whole day.

3. No reading and writing should be done for 3 to 4 weeks.

4. Consult your doctor who will assess the damage and will advise you some medicine.

In spite of the measures mentioned above, the damage to the vision is often permanent and it is therefore very important that looking at the sun eclipse should be avoided. If no improvement occurs in a month, it is likely to remain permanent.

10.10. Injury by Electric Light

People who work with powerful arc lights or with mercury vapour light may get injury to the eye by the ultra-violet rays of these lights. Similar injury is produced by the exposure of the unprotected eyes to the flame of electric welding and to the flash of a short circuit.

Soon after exposure of the eyes to the above kinds of light, there is haziness of vision and coloured after-images. Within 4 to 9 hours there develops sensitivity to light, burning pain, watering and sensation of a foreign body in the eye. The lids are swollen and the eyes are red. It is difficult to open the eye lids.

10.10.1. Prevention and Treatment

1. Protective glasses should be worn while working on the types of light mentioned above.

2. If the eyes have been exposed to such lights, hot fomentations should be applied and doctor should be consulted. Rest in bed for a day or two should be taken.

3. The condition usually begins to improve within 24 to 48 hours and disappears completely within 4 to 10 days. The vision may take a longer time to recover.

4. The eyes remain sensitive to light and should be protected for a considerable time with dark goggles.

10.11. Snow-Blindness

The highest mountains lie in or near the tropics and it is mainly in mountaineers that snow-blindness occurs. It is due to the reflection of solar rays (ultra-violet rays) by snow into the eyes. The symptoms begin several hours after the exposure of the eyes. There is pain, watering, redness of the eyes and the eye lids are so tightly closed that the sufferer finds difficulty in opening them and imagines that he has lost his sight but it is not. Rarely effects similar to sun eclipse injury of the retina occur.

10.11.1. Prevention

Deeply tinted glasses with opaque side shields should be used. Ordinary antiglare glasses with yellow tinge have been found the most suitable.

10.12. Effects of Glare on the Eyes

Glare is a condition of discomfort in the eyes and temporary depression in vision when a strong light enters the eyes specially when the eyes have been in darkness There is no injury to the eyes as occurs on exposure to various types of lights described above and from this point of view there is no justification to include it in this chapter but since I am dealing with effects of light, I thought proper to include it here.

There are two types of effects of glare on the eyes :—

1. If a patient complains that bright sunlight hurts his eyes and makes them water, he is suffering from a type of conjunctivitis called Angular Conjunctivitis. He needs correction of his refractive error and use of anti-glare glasses in addition to medicines.

2. If a patient gets a splitting headache and feels sick and depressed while in the sun even though he wears something on his head, he is suffering from glare headache. This condition requires testing of eye-sight and use of anti-glare glasses and general examination of the body to exclude any disease. General health needs improvement with good diet and tonics.

11

Defective Eye-Sight

This chapter deals with those types of defective vision which are improved with spectacles. A normal eye having a normal vision of 6/6 (100%) is called an Emmetropic eye. An eye having a defective eye-sight is called an Ammetropic eye. There are three types of defects collectively known as Ammetropia. They are hypermetropia, myopia and astigmatism. They are also known as refractive errors.

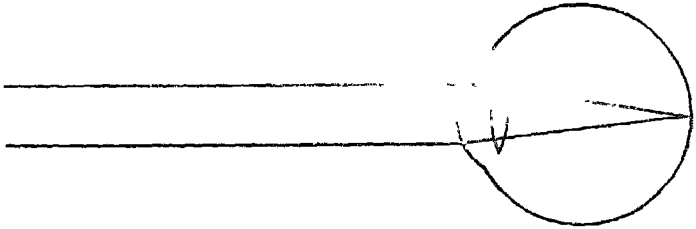
In a normal eye (Emmetropia), parallel rays of light coming from distance of 20 feet or beyond come to focus on the retina producing a clear image as shown in the diagram. An object seen within a distance of twenty feet would be focussed behind the retina if the eye was a static organ. Human eye has an ability to vary its focus at variable distance to produce a clear image. This ability is called accommodation. It is due to the change in the curvature of the lens of the eye which being elastic and plastic is controlled by the internal muscle of the eye called the ciliary muscle.

11.1. Hypermetropia

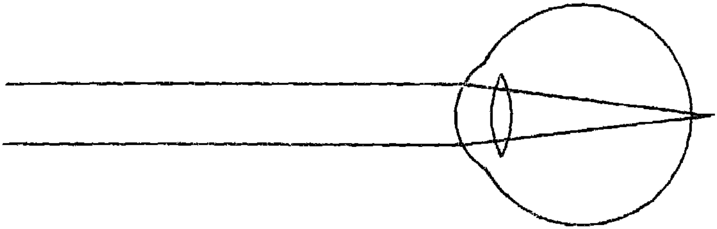
In a hypermetropic eye the parallel rays coming from a distance of twenty feet or more come to a focus behind the retina. In other words such an eye is shorter in length than an emmetropic eye. In small degrees of hypermetropia the eye is able to focus the light on the retina by continuous effort of the ciliary muscle which changes the curvature of lens. Thus in an emmetropic eye the ciliary muscle is at rest when the eye is *looking at twenty feet or beyond while in a* hypermetropic eye the ciliary muscle is always in a state of constant contraction.

11.2. Myopia

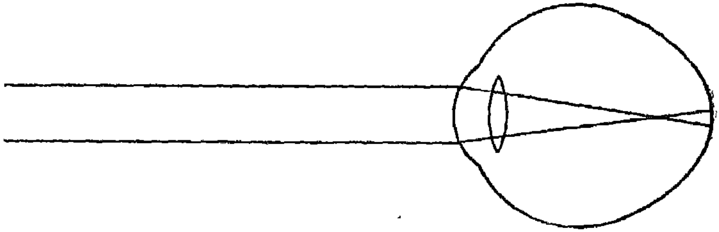
In a myopic eye the parallel rays coming from a distance of twenty feet or more come to a focus in front of the retina that is to say that the myopic eye is longer than an emmetropic eye. The image is consequently blurred. Such an eye is not able to focus the light on the retina by its own internal mechanism as a hypermetropic eye does. When the eye is looking far, the ciliary muscle is completely at rest. When the object is brought nearer than twenty feet the focus of the light will also approach nearer to retina. At a particular point depending upon the



Emmetropia



Hypermetropia



Myopia

Fig. 11·1. Diagram showing rays of light in Emmetropia, Hypermetropia and Myopia.

degree of myopia the light will come to a focus on the retina. For example a myopic eye needing a glass of -2 will be able to focus the light unaided from a distance of fifty centimetres. Under such circumstances the ciliary muscle is completely at rest. When the objects seen are nearer than fifty centimetres from the eye, the eye changes its focus by increasing the curvature of the lens to focus the light on the retina. Rays coming from a distance beyond fifty centimetres can only be brought to a focus if they could be diverged. Unfortunately, the eye has no internal mechanism to diverge the rays of light. It can only converge. Divergence of the rays is brought about by minus lenses of a spectacle. The figure of 50 centimetres is arrived by dividing 100 centimetres by two, *i.e.*, the number of the glass. In a myopic eye of minus four the figure is 25 centimetres.

11.3. Astigmatism

In this refractive error rays of light coming from any distance do not come to a point focus. In other words the rays of light from a luminous point instead of coming to a point focus in front of, on, and behind the retina, in myopia, emmetropia and hypermetropia respectively form a blurred line. This defect is not due to the change in the length of the eye ball but due to asymmetry of spherical refracting surface of the cornea and the lens. The internal mechanism of the eye is not able to correct this defect except in very small errors.

11.4. Evolution of the Eye Defects

The length of an eye ball of a newly born baby is about sixteen millimetres. The length of a normal adult eye is 24 millimetres. This length of 24 millimetres is attained at about the age of eight years. In other words the eye of an eight year old child resembles an adult eye in its structure and dimensions. Thus a baby is born with hypermetropic eye of about plus 5. It gradually diminishes by increase in the length and some changes in the structure of the eye. It becomes normal at about the age of eight years. From then onwards its length may remain stationary or increase. If it increases myopia is the result Apart from the dimensions of the eye ball having effect on the eye-sight there are other factors in the eye which also influence the eye-sight. These other structures are the curvatures of the cornea and the lens. The net result of the state of refraction of the eye is due to the combination of length of the eye ball and the degree of curvature of lens and cornea. Sometimes a child's eye may not become emmetropic at the age of eight years but remain hypermetropic. The usual limit of myopia in a healthy eye, if it becomes longer after the age of eight years, is about −5. An eye having a refractive error varying from plus 5 to (0)−(−5) is a healthy eye. Errors within these limits are not considered a disease. Just as there is a great variation from an average of 5 ft. 6 inches of height of human being so also there is a variation within normal limits of the refractive state of the eye. The degree of defect within normal limits is the result of chance combination of variable length of the eye ball and the curvatures of lens and cornea. These defects of the eye are correctable with glasses. If the eye begins to become myopic after the age of eight years the progress is slow from 8 to 15 years of age and after that it becomes comparatively rapid upto the age of about 23 to 24 years. This is related to the general growth of the body. After about 24 years of age myopia becomes stationary except for very small changes occurring in several years consequent upon the advancing age. There are certain environmental factors which also influence the progress of myopia. Heredity also plays its part. These environmental factors would be dealt with under treatment.

115. Myopia from Birth

Rarely a baby is born with myopic eyes one or both. A myopic eye from birth is a diseased eye. It is usually a hereditary disease. Such an eye is not likely to improve to normal vision even with glasses. The myopia is progressive from the very beginning. It may reach to any degree. I have seen myopia upto a maximum of −30 It could be more also. These eyes apart from an irremediable defective eye-sight are prone to serious complications in the eye, such as detachment of retina and bleeding in the retina. These two complications can be easily understood by the fact that in myopia there is increase in the length of the eye ball. In high degrees of myopia as the length increases the retina and the choroid and sclera go on stretching. In this process of stretching the retina and the choroid being highly delicate can break.

11.6. High Hypermetropia

If hypermetropia is more than plus 5, this defect is also present from the birth. It may also be a hereditary transmission. Such eyes are not diseased eyes in the same sense as myopic eyes. As pointed out already hypemetropia within normal limits is corrected by the internal mechanism of the eye, *i e.*, by constant contraction of ciliary muscle If the hypermetropia is more than this normal limit the internal mechanism of the eye fails to correct this defect Such an eye cannot focus the rays of light coming from a distance of twenty feet or beyond. These rays meet behind the retina and if the object is nearer than twenty feet the focus is still more behind the retina. Simply this means that a high hypermetropic eye has always a blurred image. If this defect is not corrected during the first few years of life by means of glasses, the eye cannot be improved to normal vision at a later date. If proper glasses have been given at the time as soon as the child is able to wear these, there is every possibility of giving a normal vision to such a child. Hence it is of paramount importance to test the eyes of a child at three to four years of age. Whenever glasses are prescribed to hypermetropic child the degree of refractive error is found out by examining the child after application of a drug called Atropine in the eyes. By this means the total degree of refractive error is determined. In actual fact this total degree is not corrected. *Example.* The examination of a child say 10 years old reveals a refractive error of plus 8 That does not mean he would be given plus 8. He probably will be given about plus 4. He will be able to see clearly with it and cannot tolerate a higher number. The deficiency of plus 4 is corrected by the internal mechanism of his own eyes. As the age advances this internal mechanism gradually becomes less vigorous. After several years he may be able to correct his defect up to plus 3. Therefore he will need glasses of plus 5. Later on he may need plus 6 and then plus 7. This is very alarming to the patient because every time when he gets himself tested there is increase in the number. He interprets that the number is gradually increasing and that his eye-sight is getting worse and worse gradually and he may become blind. It is a great psychological effect based on ignorance of facts which I feel should have been explained by an eye specialist who has seen him on the first occasion. In actual fact he is neither losing eye-sight nor his number increasing and he will never become blind. If the parents of the child had been told at the age of 10 years by an eye specialist that his number actually is eight but he is being given at present plus 4, they will not be worried later. This number will gradually increase as the age advances but to a maximum of about eight which he has already got. Whatever vision with glasses is possible at the age of 10 will remain so or rather improve but will never deteriorate provided he uses the glasses constantly and gets them frequently changed.

People who have normal hypermetropia and who are able to correct their defect by the internal mechanism of the eyes get worried if their eye-sight becomes defective at a later age. This is not an abnormality. It is a failure of the vigour of internal mechanism of the eye due to advancement of age as happens with other functions of the body. The vigour and the vitality of a person at the age of twenty is not the same as at the age of forty.

11 7. Cause of Astigmatism

As pointed out already it is due to the asymmetry in the curvature of the lens and the cornea. Such defects are either present from birth, possibly an inheritance or may be due to an abnormal birth. If the baby's head undergoes more than normal, compression either by a narrow birth canal or by instrumental delivery, *i.e.*, by application of forceps, some amount of compression of the eye balls also takes place resulting into asymmetry of the curvature of the cornea. Another cause of the asymmetry is due to Pterygiun or Scar of the cornea due to some disease occurring later on. Defect in the curvature of the lens is either present from the birth or occurs in later life due to a blunt blow to the eye. An eye with moderate or severe degree of astigmatism is not able to see clearly. It is able to neutralise the defect of minor degrees. Minor astigmatism means under one. Moderate astigmatism means one to three and above three is high astigmatism. People with moderate astigmatism usually feel eye strain. This is due to the fact that the internal mechanism of the eye, *i.e.*, the ciliary muscle is constantly trying to neutralise the defect in the interest of clear vision but is unable to achieve it. This constant effort of the ciliary muscle to neutralise an astigmatic defect is the cause of the eye strain In high degrees of astigmatism the vision is so much blurred that the ciliary muscle does not make an effort. In other words in high astigmatism eye does not make an effort when it knows that it cannot achieve while in moderate degrees it makes an effort thinking that it will achieve though it is not able to do so.

11.8. Treatment

The only treatment of all refractive errors is the use of properly centred and numbered glasses. The glasses only improve the eye-sight as long as they are worn but they do not cure it. There are no medicines or exercises which can remove the glasses. In order to obtain and maintain the normal vision, testing should be done in the early childhood period. Development of the vision occurs in the early formative period of life and if glasses are prescribed by an eye specialist they must be worn without any consideration of superstition. Neglect of child's eye-sight may be the cause of failure in the improvement of vision at a later date even with glasses. In normal degree of myopia even if glasses are not used in the early life it will be possible to restore the normal vision with glasses at a later date, because the vision of such a myopic eye is developing normally as the rays of light within a certain distance are coming to focus on the retina. Even then glasses should be prescribed to them at early age for reason given below :

A child's mental power, intelligence, general knowledge, etc., are dependent on good vision, and he has always a curiosity to explore things which are new to him and to see what he has never seen. When you take him to the market or in travelling he has a curiosity to see all advertisements, strange men, movement of vehicles, etc. He must have a general knowledge of all these when he grows up. If the myopia is uncorrected, he develops in a limited world wherein he is at a considerable disadvantage in comparison with others—a handicap which may entail a seeming limitation of intelligence and curtailment of interest which are frequently ascribed to stupidity and backwardness or to naughtiness while they are really due to the physical defect. He is debarred from free intercourse with his fellows and unable to enjoy a free appreciation of life. I hope this would be sufficient to remove your doubts and superstitions and you will not suppress the mental development of your child and mar his future.

If the glasses have been worn they should be examined every two to three years for any change. Criteria for changing the glasses are :

1. Diminution of vision from the previous occasion.
2. Glasses cause eye strain or headache.

If these two things are alright, there is no necessity of changing the glasses. It is essential that you should keep carefully a record of your prescriptions. These will be a guidance to your doctor who tests your eyes and will throw light on the nature of the progress. It is also advisable as far as practicable to get your eyes tested from the same eye specialist. Apart from giving him the knowledge of the progress of your refractive error on which he will be able to advise, there is another important reason. An eye specialist might give you a lower number than actually needed for reasons of intolerance of a correct number at an initial stage. For example he gives you −4 instead of −4·5 actually needed. After some time you get used to these glasses and then you go to a different eye specialist who gives you −4·5. In actual fact your number has not increased but you have been given your actual number by the second eye specialist.

If the child has hypermetropia or astigmatism to the extent that the internal mechanism of the eye cannot neutralise it, the light rays entering the eye will never be focussed on the retina. This would mean that this child would always see everything blurred. The development of the vital portion of the retina, *i.e.*, the yellow spot will be retarded. When this child grows older he will approach an eye specialist for the testing of his eyes either for eye strain or because of appearing for medical examination. At that period of life it is usually not possible to obtain a 100% normal vision in spite of the glasses. It is therefore essential that the testing of the children's eyes is of paramount importance in the early childhood. Sometimes one eye is highly hypermetropic or astigmatic or myopic and the other eye is emmetropic. Such persons are not aware of the defect of their one eye for a long time because they can see very well with one eye. Unawareness of this defect is due to the binocular vision of mankind. They come to know of this defect by chance, *i e.*, if they happen to close their healthy eye and see with other eye, or during a medical examination.

Many people living in this world with defective eye-sight are carrying on their duties in life. Since the time they are conscious of the world, they know that whatever they see is normal. They are living in a misty world and they think that the world is like this for every one. They become aware of the difference between their eye-sight and the eye-sight of the normal people by chance. When they are given proper glasses in adult life, they begin their life in a new clear world.

Hypermetropia and astigmatism do not increase. They either remain stationary or decrease. It is the myopia which never decreases but either remains stationary or progressive. The increase of myopia is due to environmental factors and heredity. Both these factors can be removed and myopia may be prevented to appear and the progress may be arrested to a certain extent.

11 9. Factors which Influence Myopia

1. Myopic parents generally beget myopic children. Chances of myopic children are more if both parents are myopic than when only one is myopic. Small degrees of myopia do not matter.

2. Myopia usually begins after the age of 8 years and its progress is slow up to 15 years of age. Thereafter the progress is comparatively rapid up to 22 years of age and this period is associated with rapid growth of body and lot of studies. Majority of cases are simple and stop progressing after about 22 but some of these simple ones also may become progressively high. These few simple myopes either have been markedly influenced by other environmental factors mentioned below or have hereditary influence.

3. Reading in inadequate light and glare in the eyes have influence on myopia.

4. Long hours devoted to reading story books and comics printed on bad paper with small types without intervals of rest.

5. Doing too much of close work in bad light under the circumstances of bad health, bad hygienic surroundings, want of fresh air and physical exercise.

6. Reading while lying down on the bed, provided illumination is adequate, is not harmful but adopting all kinds of crooked posture either in bed or chair and bending the head to the work, all influence myopia adversely.

11.9.1. Preventive Measures

1. Two highly myopic persons should not marry. If one of the parents is highly myopic, chances of getting myopic child are still there but much less. If both parents are highly myopic or even one parent or uncles and aunts are myopic, you ought to be guarded about the future of your child and consult a doctor for examination of the child at an early age.

2. Growing children should not be made to do too much of close work up to the age of eight years. Their attention should be more engaged in open air pursuits.

3. Books for children should be printed in bold types and glazy paper should not be used.

4. Child should always read with erect posture. Reading in moving vehicles should not be encouraged.

5. Books should be held from the eyes about 30 centimetres away. If the book is held in the hands, the angle at the elbow should be about 90°.

6. Day light is better than artificial light for reading and writing. If it is artificial light, it should come from behind and from the left in right handed persons so that there is no shadow of the hand on the paper while writing. If there is a shadow of the hand on the paper, child adopts all sorts of posture to avoid it.

7. Continuous reading should not be encouraged. There should be rest for about ten minutes after every one hour of reading. During these ten minutes, the child should look at distance in the open air and have fresh air.

8. Care of the child while in school should be taken according to the suggestion in the chapter of Ocular Hygiene in relation to Schools.

9. Child should not be allowed to study during illness and recovery period.

10. Great attention should be paid to the general health of the child. A weakling is ill-fitted to stand the strains of the studies.

11. Every child before entering the school should have his eye-sight tested and periodic examination should also be done subsequently. If any child is found to suffer from defective eye-sight, he should use suitable glasses constantly.

In general poor physical health, bad eye habits, and excessive near work form a vicious circle and this circle must be broken. Constant use of properly numbered and centred glasses, robust health and normal habits will all help in the arrest of myopia. Normal habits only come if the eye-sight has been corrected. Myopic patients should know what a distant view is, enjoy outdoor things, avoid spending much time crouched over books and expand their lungs by running about out of doors and to live a normal child's life. A patient accustomed to hold things very close may continue to do so despite the glasses. Such a child, with its face in the book, lifts up the glasses and says "Oh, mummie ! I can see to read much better without glasses". This habit must be discoveraged.

Many parents of myopic children realise the benefits obtained when the myopia is corrected. A mother said of her daughter, "She is so much improved in every way since she had her glasses. They have not only opened up the world to her but they have opened her up too." It is important to catch them young. before vicious circles have formed. Encourage girls for swimming, dancing, tennis and other games and drills which they get at school. The same idea applies to the boys.

When a case is seen too late, *i.e.*, for instance, there is progressive myopia in a child having myopic parents, the treatment may then need to be drastic. In such a case school must be stopped for a time, not merely to rest the eyes, but so that real efforts can be made to obtain robust health and good habits. Deep breathing and other physical exercises to correct round shoulders should be encouraged. Such cases should not aim for an occupation in which accurate vision is essential. They should be encouraged to choose a career healthier and more suitable.

11.10. Unequal Number of Glasses

There is a condition known as Anisometropia in which there is a difference between the number of glasses of two eyes. Generally speaking difference of 2 5 between the two glasses is tolerable. This is due to the fact that the size of the image formed on the retina depends upon the number of glass. The difference in the images on the two retinae, if the difference between the two glasses is within 2·5., is so little that the brain does not find difficulty in fusing. If the difference is more, brain finds it difficult to fuse the two retinal images and the person complains of discomfort with his glasses. In order to obviate this defect it may not be possible to give full correction in the worse eye. However it has been noticed that such full correction is possible if the glasses are given in the early childhood. The fusion faculty of a child is liable and it could be trained to fuse the two differently sized retinal images. But once the fusion faculty has developed it is usually not possible to train it later on to fuse the two differently sized retinal images. This is another important reason that glasses must be worn if needed from childhood. There are people who are wearing spectacles with marked differences in two glasses. These people are one eyed, of which they are not aware but they could be shown by certain tests conducted by an eye specialist. In these persons brain ignores the fusion. It receives one image at a time and the eye with better vision becomes a dominant eye. These people also have some degree of squint.

In conclusion I would strongly advise that every child's eye must be tested in the early life and if the vision is not normal, glasses must be worn from that time. It is pleasing to note that the Government has introduced school health scheme which will probably cover all schools in India and the children's eyes will be better looked after.

11.11. Testing of Vision

It is often difficult to estimate the vision of a young infant. However it is possible to estimate the vision of a three years old child by certain special tests if sufficient care and patience are exercised. The testing of vision in an adult is done by a distant letter chart. This chart has letters constructed in different sizes. The chart is kept at a distance of 20 ft. from the patient. There should be a light of about 10 ft. candle power or good day light on the chart. The testing should be done with one eye closed. The method of covering of the eye is not by putting the hand over the closed eye but both eyes should remain open and something like a cardboard should be kept in front of one eye. If the patient closes his eye by his hand, he will find it difficult to read the chart, when this eye is tested because he takes some time to adjust himself to read with this eye. An impatient eye specialist might give a verdict of the vision of your this eye before you are able to adjust yourself and read correctly. This might result in a failure in the medical examination for which you will probably appeal and win it but after an unnecessary great mental stress. In the distant letter chart there are seven lines from top to bottom and the quantitative estimation of the vision is as follows :

First Line	6/60	10 %
Second Line	6/36	17 %
Third Line	6/24	25 %
Fourth Line	6/18	33 %
Fifth Line	6/12	50 %
Sixth Line	6/9	67 %
Seventh Line	6/6	100 %

The near vision is tested by near vision charts and it has paragraphs in different sizes. A normal person should read the finest para at a distance of 30 centimetres comfortably.

12

Old Sight

I have already pointed out that the lens in the eye loses its elasticity with advancing age. In a normal eye when objects are seen from a distance nearer than twenty feet, the lens becomes more curved and the light is focussed on the retina. At the age of ten years the nearest point from which the light can be focussed is seven centimetres. This is called the near point. As the age advances this near point gradually recedes. At the age of thirty-six, it is about 14 centimetres. At the age of forty-five it is 25 centimetres and at the age of sixty it is 100 centimetres.

In the majority of cases near work is done at an average distance of 25—30 centimetres from the eyes and therefore in an emmetropia the limit of clear vision is reached at 45 years. Working at this distance continuously would mean that the lens is subjected to its maximum to focus the light on the retina. This focussing is due to the contraction of ciliary muscle. A continuous contraction of the ciliary muscle to its maximum would result in eye strain. For the comfort of the vision we should not let our ciliary muscle to its full contraction. We should keep one-third in reserve and utilise two-third contraction. This would mean that in a normal eye necessity for reading glasses arises at about the age of forty and it should not be considered as a disease. The condition is called technically presbyopia. The relation between the onset of presbyopia and age varies with the individual and his habits.

12.1. Habit

The person who has the habit of reading his book on his knees complains of discomfort later than one who is used to reading more closely. A carpenter keeps his work at a distance of 30 to 40 centimetres while a compositor or engraver of the same age and with the same refractive state of the eye keeps his work at about 20 centimetres. Obviously the former will need near glasses at a later date than the latter.

12.2. Height

Greater the height of a person, greater is the distance between his eyes and his near work. He therefore will need glasses later than a short statured person.

12.3. Sex

Women need glasses earlier than men for three reasons.

(*a*) By nature of their short stature.

(*b*) They keep their near work closer than men such as knitting and needlework.

(*c*) Every child birth takes away certain amount of reserve power of the whole body including the ciliary muscle.

Therefore greater the number of child birth earlier is the onset of presbyopia.

12.4. Climate

People living in the West need glasses at a later date than those living in the East. The probable reason for this is believed to be due to the early hardening of the lens due to heat rays of the sun.

Considering the above factors the onset of presbyopia is between the age range of 37-44.

The above description applies only to Emmetropes and those Ammetropes who have been made normal by glasses. If an individual is hypermetropic and is not using glasses for distant vision he will need reading glasses at much earlier age while an uncorrected myopic person will need glasses at a much later date.

Generally speaking in an Emmetrope the number of glasses needed according to the age is as follows :

Age	40	Glass	required	plus ·75 D
,,	45	,,	,,	plus 1·5D
,,	50	,,	,,	plus 2D
,,	55	,,	,,	plus 2·5D
,,	60	,,	,,	plus 3D
,,	over 60	,,	,,	plus 3 to 3·5D

Above is only a rough guess.

The actual number for an individual will be decided according to his height. occupation, habits and sex. The rough estimate for the Western people is as follows :

Age 45	Glasses	required	plus 1·0 D
,, 50	,,	,,	plus 1·5 to 1·75 D
,, 55	,,	,,	plus 2·25 D
,, 60	,,	,,	plus 2·5 to 3 D
,, 65 and over	,,	,,	plus 2·75 to 3·5 D

In an Ammetrope the reading glasses are always added to the number of distant glasses. If an individual needs plus 1·5 for distance, whether he is wearing it or not he will need a glass of plus 3 at the age of 45 for reading purpose. If an individual has a myopia of −1·5 he will not need any reading glass at the age of 45. At that age because −1·5 is exactly cancelled by plus 1·5. He will need a reading glass of plus 0·75 added to his −1·5 at the age of forty and at the age of fifty he will need −1·5 plus 2·0 that is (plus 0·5). These examples are based on the rough guess given above.

Many people get worried when they find that their number is gradually increasing for near glasses. In actual fact they need not worry because it is a natural process of the eye and it is not a disease.

If you are prejudiced against the use of glasses, you can avoid it for some time but ultimately you have to use it. Reading without glasses at the presbyopic age will cause eye strain, *i.e.*, watering, pain in eyes, redness and necessity to keep your reading matters at a long distance. These signs will force you ultimately to use glasses. However one thing is certain that by putting off the use of glass as long as you can does not increase your number. In other words there are no structural changes in the eyes. Once you have started using near glasses, you should get them changed when you find difficulty in your near work with the old glasses. Usually one pair of glass serves you for 2 to 3 years. If there are frequent changes in your glasses, there is probably something wrong with your eyes, *i.e.*, cataract, glaucoma, diabetes and general debility. Your doctor will be able to spot this out.

12.5. *Bifocals*

It is quite obvious that your distant vision cannot be clear with reading glasses. If you have only reading glasses in your spectacles you have to remove it when looking at a distance. This means that you should keep your one hand free to put it on and off as necessary. An office-goer can easily manage it but it is inconvenient for a housewife and a teacher. Those who also need distant glasses will have to keep too pairs. The inconvenience of changing the glasses from distant to near or *vice versa* can be removed by means of bifocals. The top part of the glasses is for distance and the lower part is for near. You enjoy vision at all distances without changing the glasses.

In case of emmetropia the top part is plane. Those who are emmetropic need not wear their glasses while not doing any near work, *i.e.*, in social life and travelling, while in office during their near work, they can wear it and need not remove it while looking at distance.

There are two types of bifocals, in one the junction between the two glasses is visible and in others it is invisible unless looked at it carefully. The former gives an estimate of your age to on lookers and is cheaper. But there is no supremacy of one over the other as far as the vision is concerned.

There is another type of glass for Emmetropes, *i.e.*, 'D type' as shown in figure. In this the individual can see his near work through the glass and he sees at a distance over the glasses.

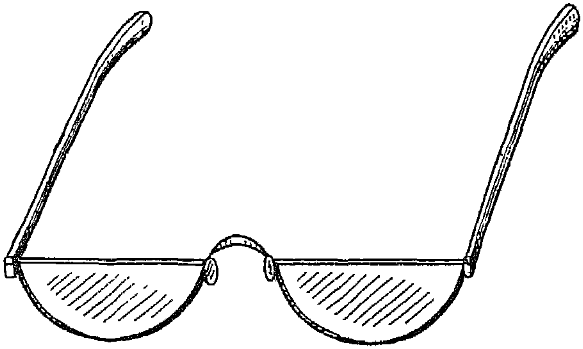


Fig. 12·1. Diagram of D type of Spectacles.

13

Eye Strain

When the act of seeing reaches our consciousness, we call it eye strain Normally we see without consciousness as we breathe without consciousness. It is one of the most common troubles among the patients attending the eye department of a hospital. Its appearance depends partly on the use to which the eyes are put, partly on the efficiency of the eyes and partly on the capacity of the individual to withstand sustained efforts. Following are the causes of eye strain :—

13.1. Causes of Eye Strain

(1) Uncorrected refractive errors.

(2) Lack of balance between the muscles of the eyes, *i.e.*, latent squint discussed in the chapter of squint.

(3) Use of wrong glasses.

(4) Use of improperly centred glasses and badly fitting frames.

13.1.2 Physical factors

Since one of the cause of eye strain is muscular and mental fatigue, it is obvious that the breaking point will be reached more readily in the feeble than in the robust. Symptoms which normally would have not appeared in certain minor defects, either environmental or pertaining to the eye, tend to appear in the debilitated and in those convalescing from an illness or in women after confinement and during lactation. Over-work, undernutrition, exhaustion, insufficient sleep, anxiety, emotional strain may all cause eye strain even in the otherwise healthy.

13.1.3 Nature of object

Eye strain also depends upon the size of the details which are required to be seen. Minute objects are viewed at a close range, thereby causing an almost full contraction of the internal muscles of the eyes (ciliary muscles) and prolonged sustained contraction of these muscles causes eye strain. Poor definition of the object, *i.e.*, illegible print is another cause. Constant movement of the object of attention necessitates constant and rapid eye adjustments—a factor seen in reading while travelling in a vehicle. All these factors are environmental.

13.1.4 Illumination

In olden days nature's daylight was sufficient for the few activities of man but in the present day civilized world this light is proving insufficient for his constantly widening activities at work and at play, specially in the urban areas. Buildings are erected so close together that daylight is squeezed out between them. The artificial light is more constant and dependable and a cloudy day does not upset our routine any more. Therefore *our eyes are mostly exposed to artificial light which, if inadequate in quantity, quality and distribution, may cause eye strain.* Prolonged use of artificial light has no detrimental effect on the eyes provided it is adequate. Fit insensitive person with good vision will get along happily with a level of illumination which would make work impossible to the sensitive, ailing or those with eye defects.

(*a*) *Quantity.* It has been determined that the vision of an individual increases if the light intensity increases from 0 to 12 foot-candles and beyond this there is no appreciable change in the acuity of vision. Based on this experimental evidence 12 foot-candles of light is sufficient for a normal eye. 12 foot-candle is approximately the light given by ordinary white frosted 40 watt electric bulb with a good reflector at a distance of 24 inches. At 18 inches the intensity of light of the same bulb is 20 foot-candles. The same bulb without a reflector and frost gives about 3 foot-candles at 24 inches and 5 foot-candles at 18 inches. By one foot-candle we mean the intensity of light of a standard candle at a distance of one foot. A standard candle weighs 120 grains and burns for one hour.

12 foot candle light is not sufficient in the late fifties and sixties and for such fine work as engraving, drafting and embroidery. Albinos need less light. Usually after a long period of illness strong light is not acceptable to the eyes and use of dark glasses is advisable for sometime.

(*b*) *Quality of Light.* The best lighting is daylight but even in sunny climates this is inadequate for a large percentage of the time because of high and close buildings and change of weather. Artificial light is usually necessary everywhere at some time. Natural light is diffuse and glareless but an artificial light can be glary though it may be much less intense than the day light. Fluorescent lighting is diffused and the eye can stand it better because its light is whiter than the light of an ordinary bulb which is yellowish. The white light is cooler to the eye, less glary and diffuses better. Fatigue comes more readily with red and yellow than blue and green.

(*c*) *Distribution.* This is important in two respects, *i.e.*, avoiding of glare and the provision of balanced illumination at the area of observation and surrounds. To avoid glare all intense light sources should be outside the line of vision. If it is impossible, eyes can be protected by wearing a peaked cap or flanged spectacles. A balanced illumination is equally important for comfort and efficiency. There is a great reduction of speed of vision and visual acuity if there is marked difference between the illumination at the area of observation and surrounds. If the surrounding illumination is more, there is decline in performance, and it may cause strain to the eyes if work is done in a light surrounded by shadow. It is quite natural that while working on the table we also look around us for a while interruptedly. This leads to change of adaptation of eyes from light to darkness and back to light. This frequent adjustment and readjustment fatigues the eyes. Illumination in the surround should be less than the area of observation. Therefore efficient lighting requires not only foot candles but engineering and design also. A useful test for adequate distribution of light is as follows :—

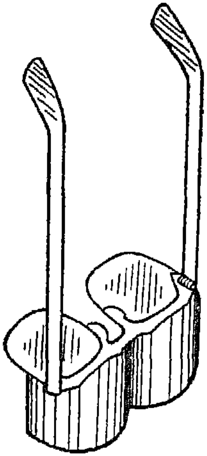
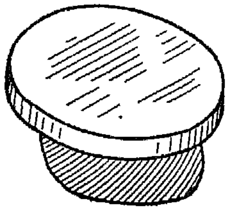


Fig. 13·1 Flanged spectacles.

A pencil is held parallel and three inches above a sheet of paper upon which light from a main source falls perpendicularly. A sharp and clear cut



13·2. Peaked cp.

shadow indicates too concentrated light while a blurred shadow indicates adequate diffusion.

(*d*) *Flickering Light.* A flickering light such as may be seen with moving machinery or was common in the early days of cinema excites rapid changes of adaptation of the eye and considerable psychological annoyance.

13.2. Symptoms of Eye Strain

1. Eyes feel tired, hot and uncomfortable specially after long periods of close work.
2. *Pain in the Eyes.* Any pain in the eyes unconnected with redness is almost always due to eye strain and rarely due to some deep-seated disease. The pain is mild and dull but may be severe. It may be situated in the eyes themselves or behind the eyes.
3. Heaviness in the lids.
4. A sensation of drowsiness on doing close work.
5. Watering of eyes.
6. Giddiness.
7. *Headache.* Headache due to eye strain may be in any part of the head but usually it occurs on the forehead. It may be permanent or periodic and usually it is associated with the use of eyes.

13.3. Treatment

Treatment depends on the cause. You should consult your doctor who would try to find out the cause and advise you accordingly. Normal vision, *i.e.*, 6/6 does not necessarily mean that you do not need glasses. If you have some refractive error, you may be able to neutralise it by your own internal mechanism of the eyes and read 6/6 on the vision chart. Constant utilization of the internal mechanism may cause any of the symptoms of eye strain, more so if you are debilitated, and the function of glasses is to give rest to this mechanism.

Your doctor mainly deals with the causes connected with your eyes but for the environmental factors you have to help yourself with the help of the doctor and electrical engineer.

Temporary relief can be obtained by the following methods :

1. Stop doing close work.
2. Gently rub your eyes.
3. Sit comfortably on a chair so as to relax your body as much as you can and put the hollow of your palms over the closed eye lids without pressure for five to ten minutes and think of darkness.
4. Wash your eyes with cold water.
5. Have a stroll in the open air and look at distance.

13.4. Eye and Movies

Seeing cinemas does not harm the eyes. There may be certain amount of eye fatigue after holding the eyes fixed on the bright screen. The neck muscles may get tired and lungs may cry for a breath of fresh air but there is no actual physical damage. To prevent strain in the eyes adopt a posture in such a way that there is no strain on the neck muscles and the eyelids should lie comfortably on the eye balls instead of sitting erect with staring eyes. There should be frequent blinking.

14

Cross Eye (Squint) (भैंगापन)

By squint we mean cross eye. It can occur at any age but is most common in childhood. A child with squint not only has permanent eye defect but also develops an evil temper. He is unsociable and stubborn. It is sometimes difficult to convince the parents that their child's behaviour problem is due to his eyes. The child either becomes a fighter or may become shy and retiring by nature, always avoiding his playmates. The effect of a squint on a growing girl's life is serious, both for the girl and the parents.

When a child develops a squint, the parents are often told that the child will grow out of it, and the parents are happy to listen to this easier and pleasanter advice. But the chances of his growing out of squint are so slim that any mother who neglects to consult a doctor when the cross-eye is first noticed and who waits trustingly for the eyes to straighten themselves is usually condemning her child to a life of permanent disability.

Normally the two eyes when looking at an object at a distance appear to be placed symmetrically in their bony sockets and lines drawn perpendicularly from the centres of the corneas are parallel. When an individual looks at a near object, the two eyes slightly move in equally and symmetrically. In both conditions if you cover one eye, the other eye does not move but continues to look at the object. Under such normal state images are formed on the symmetrical parts of the retina and they reach the brain where fusion occurs. This is called binocular vision. Any deviation from this will cause squint. There are three main types of squint :

(1) Nonparalytic squint.

(2) Latent squint.

(3) Paralytic squint.

14 1. Nonparalytic Squint

This type of squint usually occurs between the ages of 2 to 4 years. It may be of one eye called unilateral squint or of both eyes called alternating squint.

14.1.1. Unilateral Squint

In a unilateral squint (supposing of left eye) if right eye is covered, left eye at once becomes straight to see the object. This obviously indicates that before covering the right eye, only right eye was seeing the object and the left eye was not being used. As soon as you uncover the right eye it moves to see the object and becomes straight while the left eye squints. If this condition is allowed to persist no chance is given for the development of vision of the cross eye. It is a simple fact that anything if not put to its use, loses its function. If a child is seen early, restoration of vision is possible with treatment but if the squint remains neglected for several years, chances of recovering of vision are remote.

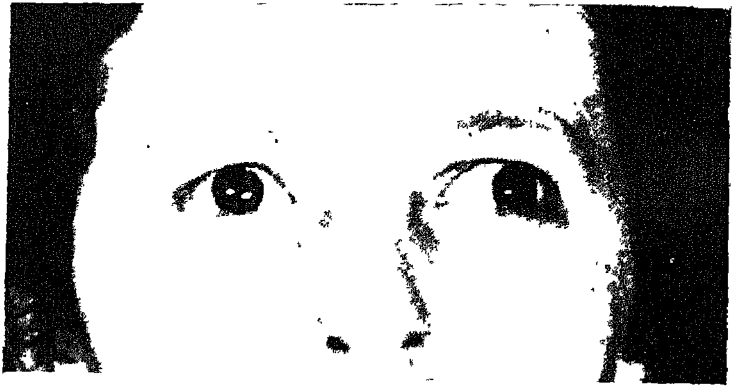
14.1.2. Alternating Squint

In this type of squint sometimes right eye and sometimes left eye becomes cross. Here if you cover the straight eye (right), the cross eye (left) becomes straight. On removing the cover the left eye continues to remain straight while the right eye appears cross. This is better than the unilateral squint because there is a continuous development of vision in both eyes, but the individual for practical purposes is one eyed.

14.1.3. Intermittent Squint

Sometimes the squint may be intermittent, by which I mean that the squint is not present all the time but appears for a moment or a short while and then disappears It usually appears when the child becomes irritable or the health becomes weak. So long it remains intermittent, the development of the vision continues to occur but once it becomes constant, prompt steps have to be taken. The intermittent squint usually becomes constant after an illness. Sometimes onset of a squint is preceded by an illness like measles, typhoid, smallpox, influenza, etc.

A patient of cross eye.
Left eye has Internal (Convergent) Squint.
[*See page* 77]



A patient of cross eye.
Left eye has External (Divergent) Squint.

[*See page 77*]

14.1.4. Causes of Non-paralytic Squint

As pointed out previously there are six tiny muscles attached to each eye. They move the eye in all directions and their movement is controlled by the brain through the nerves supplying these muscles. These muscles move the two eyes as a team. If one eye is closed and if you look in a certain direction, both the open and the closed eyes move together. If an operated eye is to be kept quiet after an operation, both eyes have to be bandaged to prevent movement. The object of this symmetrical movement of the two eyes is to give us the images of both eyes simultaneously. The two images are then fused by the brain into one by a faculty called Fusion Faculty.

At birth the eyes of the infant may turn in or out or up or down separately because their fusion faculty is not yet fully developed. It should not cause any worry to the parents. But if there is lack of symmetrical movement after the first six months of life, it should then receive attention. Such eyes may become permanently crossed unless treated properly and early.

Concrete causes of non-pàralytic squint are :

1. Marked inequality of the vision of the two eyes.
2. High degree of hypermetropia.
3. High degree of congenital myopia.
4. Heredity.

Cross eye may be of the horizontal variety or of the vertical variety. In the former case the two eyes are either too close to each other (convergent or internal squint) or too far away (divergent or external squint). In the vertical variety one eye is at a higher level than the other eye. In the latter variety, the image of one eye will be higher or lower than the other. In order to avoid seeing double, the child may acquire the habit of tilting his head to one side in order to bring the images of the two eyes closer together. If unsuccessful, he may ignore one of the images. Hence all children with abnormal head posture should receive an eye check up.

Whatever be the cause, the cross eye in an older child or adult is usually the hall-mark of careless parents.

The cross eye may develop soon after birth but more commonly it appears in the 2nd, 3rd or 4th year of life and when it is first noticed, help should be sought. In the early stages, a child may need only properly fitted glasses to straighten his eyes. If there is defective vision in one eye, the good eye may have to be covered. This forces the bad eye to do all the seeing. The treatment may also be operative which may have to be done in stages. The operation is only on the external muscles of the eye and in no way does it interfere with the vision of the eye. Exercise of the muscles on a special type of machine only possible in big hospitals. is sometimes needed. Best chance for the success of the exercise is before the age of 6 or 7. It has been found that during these first formative years of life the eyes are more malleable and more responsive to treatment. The earlier the treatment is started, the better are the chances of complete cure.

At the age of 8 the eye has grown almost to its full size, and the possibility of restoring useful vision to a poor visioned eye after this age decreases rapidly. However it must still be tried and in many cases partial improvement is there. An eye can always be straightened cosmetically at any age but vision cannot usually be restored after the age of 8 years.

14.2. Latent Squint

These cases do not show any cross eyes. They possess weak eye muscles which is not quite severe enough to cause a frank cross eye. A weak eye muscle means an additional strain in order to maintain a nice balance necessary for comfortable vision. The result of this additional strain may be headache, watering, burning sensations in the eyes, *i.e.*, symptoms resembling those from an uncorrected refractive error. Reading or any type of near work becomes a painful procedure. There may be difficulty in changing the focus of the eye from distant to near or *vice versa.* There may be sickness and dizziness while moving in a transport because of additional effort necessary to focus rapidly moving objects.

These cases may develop frank cross eyes when fatigued or suffering from some general illness. They may disappear when the eyes are rested or after regaining health.

Many people may go through their entire life, symptomless because their weak eye muscles are of a mild nature and their work does not put the weak muscles to much strain. In others the symptoms appear when the demand of the eyes is increased enormously.

The treatment of this condition is primarily of using glasses if needed so as to take away the strain due to refractive errors. Exercise to strengthen the weak muscles is a further supplement. These exercises are given on a machine in the hospital.

14.3. Paralytic Squint

If one of the muscles of the eye is paralysed, the eye ball will not move in that direction. Such squint is either present from birth or appears later in life. If present at birth, there may be history of difficult delivery. If this is not treated two things may occur :—

1. Spontaneous cure : Such a happy result can only happen if the injury was mild. It is necessary to wait for 6 months for the spontaneous cure.

2. Squint persists and after a long time it assumes the form of a non-paralytic squint. In this condition there is lack of development of vision.

The paralytic squint may appear later in life and is always due to some disease of nervous system or injury to the head. Treatment of this condition is the treatment of primary cause One great disadvantage of such squint is double vision which is annoying to the patient. If the patient is a child, they learn to ignore one image but it is difficult to do so in an adult and he is in great misery. To avoid this misery, only treatment is to close one eye so that no double vision occurs and the primary cause is treated. Normally 6 months are allowed for the recovery of a muscle paralysis by nature and treatment and if no further recovery occurs, operation is done to bring the eye in parallelism.

14.4. Prevention and Treatment

Every child's eye must be examined at the age of 3 years and just before entering the school. This is all the more important in those cases where squint already exists in some members of the family. On the appearance of a squint, a doctor must be consulted as early as possible. From the treatment point of view there are only four methods of treatment. The first method is to find out any refractive error. If present, glasses must be prescribed. A child of 3 to 4 years of age is able to wear glasses. If with glasses vision of one eye is not equal to the other eye, the better eye is kept covered so that the cross eye is exercised to develop vision. This is continued as long as the vision continues to improve till it comes to almost an equal level with the other eye. Checking of vision is done every fortnight. If there is no improvement in vision after a month or at the most one and a half month, there is no further chance of improving the vision. Recently new methods have been discovered to improve the vision but they are still not available in India. The covered eye does not lose its vision. There is a rare type of squint when the cross eye is covered.

14.4.1. Method of Cover

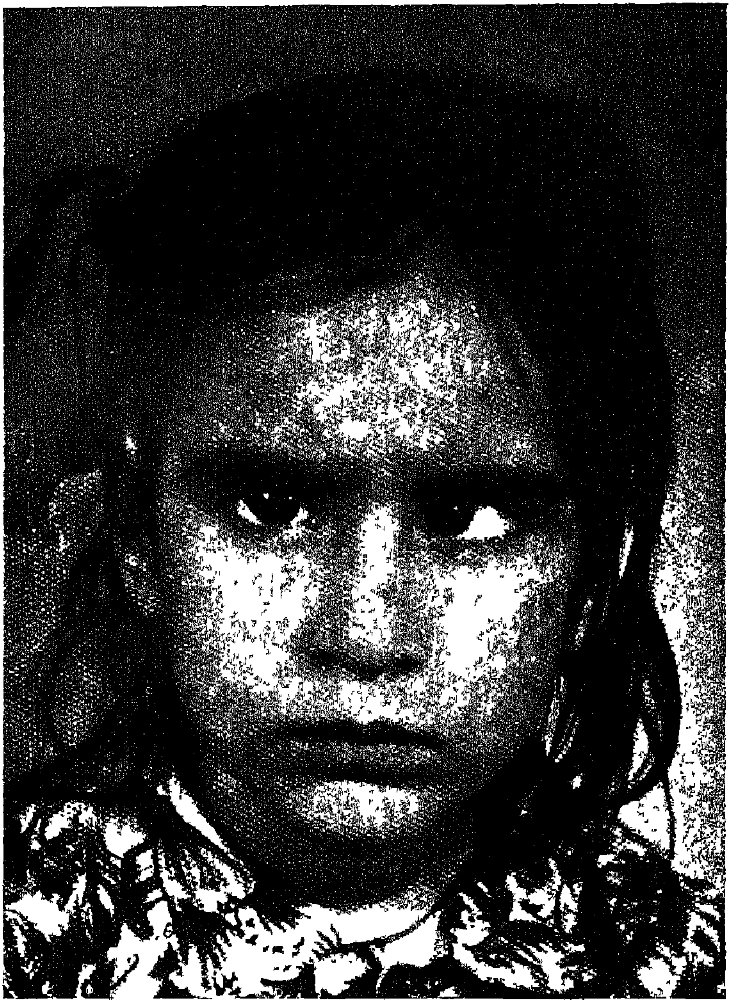
A circular pad of cotton covered with gauze called eye pad is put on the closed lids of the better eye and kept in place with two to three strips of adhesive plaster. If glasses are used it is worn over it. This is kept day and night and is removed only when washing the face or bathing. Black ebonite covers are available with the opticians. They can be fitted on the spectacle frame to cover the eye.

14.4.2. Exercises

Some types of squint need exercise of the eyes which can be given only in hospital where such facilities are available.

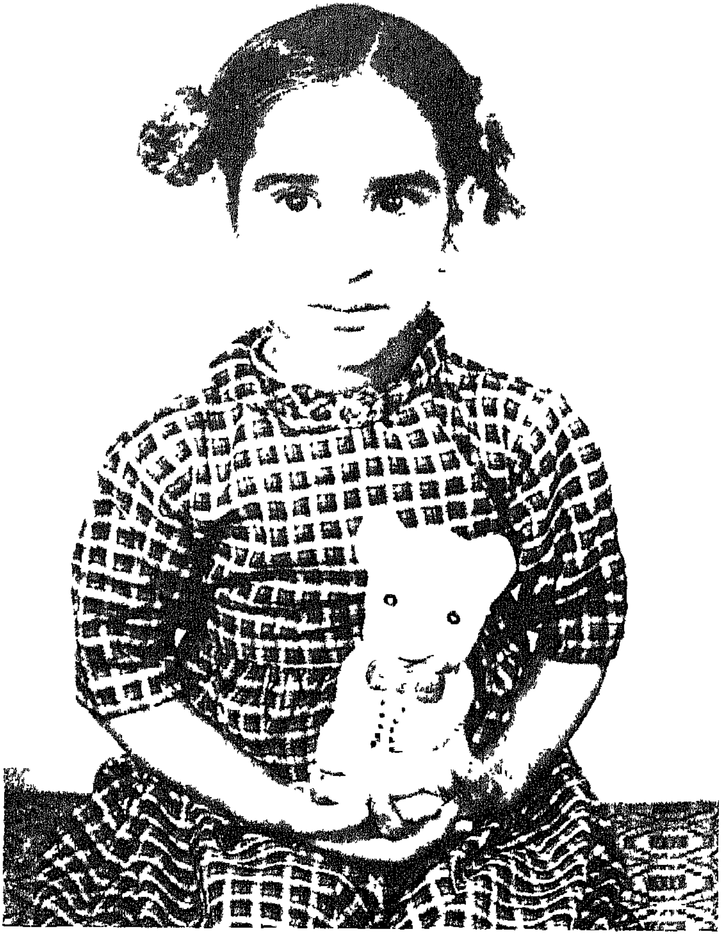
14.4.3. Operation

The purpose of the operation is to straighten the eyes. It does not improve the vision. There are some squints which can be rectified by glasses only. All other cases need operation. This operation is done to strengthen or weaken a particular muscle. Parts of the eye concerned with vision are not touched. The operation is planned beforehand and it may be done on one eye or both eyes and in stages. The interval between the stages may be two to three weeks. After the operation usually one eye is bandaged and the patient after the operation can sit and eat anything he likes. He is not to be restricted as a cataract operated case. The bandage is generally not required after three or four days and the patient is discharged with some



A patient of cross-eye. (Before operation)
Left eye has Internal (Convergent) Squint.

[*See page 80*]



Same patient. Eyes are straight. (After one stage operation.)
Compare the marked outlook of the child after
the eyes have been put straight

[*See page 80*]

medicine. The redness in the eye continues to remain for two to three weeks or more.

Other causes of squint are some diseases of the eye which interfere with the vision in early childhood. Treatment of such squints is only operation which can be done at any age convenient to the patient. It is pointed out however that if the cross eye has no vision and if it is operated to straighten, the effect lasts for some years. It may again become cross because the healthy eye is not able to keep it in yoke because it has no vision. It is for this reason that when operation is done on a internal squint, it is slightly under-corrected because after some years it is likely to become straight. An eye with very little vision tends to become straight from an internal position and later on external. When operation is done on an external squint, it is done to make the eye slightly internal so that it will also become straight after some time.

15

The Eye in Traffic

15.1. Visual Capacity

A driver of a vehicle must have normal visual capacity which means much more than ability to see at distance. Normal visual capacity includes following seven things:

1. Good visual acuity.
2. Normal field of vision.
3. Binocular single vision.
4. Colour vision.
5. Ability to look far and then in turn near without any trouble, *i.e.*, ability to accommodate normally.
6. To see well in darkness.
7. Normal muscle balance of the two eyes.

15.1.1. Good visual acuity

A driver should be able to see the number of a car plate at a distance of 25 yards and for this his vision should be at least 6/12.

15.1.2. Normal field of vision

By field of vision I mean that while looking at an object an individual is able to see around himself without moving the eyes. This field of vision enables a driver to see vehicles and people as pass by him when he is looking straight ahead.

15.1.3. Binocular single vision

This means that an individual sees an object with both eyes together which is possible only if there is no squint. It enables a person to gauge just how far another car is ahead of him, whether it is going faster or slower than he is and whether there is enough space between the two cars to squeeze through.

15.1.4. Colour vision

A driver must easily distinguish between red and green colours used in traffic lights even in fog, rain and dusty atmosphere. A driver should not wear any dark glasses as they may cause confusion in distinguishing the traffic lights.

15.1.5. Ability to change focus

A driver should be able to look far and then in turn near without difficulty. Failure to do that may be either due to defective eye sight or latent squint.

15.1.6. Vision in the darkness

Night traffic accidents are directly related to illumination and night vision. Beyond the confines of a city area night driving depends largely on the illumination and driver's own headlights. Bad head lamps are a source of danger. But greater source of danger is the other fellow's headlight.

The powerful headlights of an approaching car are troublesome for the following reasons :—

The headlights throw a sharp glaring light which blinds us immediately. Secondly, there is after-effect on our vision. The vision is disturbed for some time afterwards during which unpleasant things can happen. These headlights also have a tiring effect on the eyes. It is therefore advisable for drivers to dip their lights when approaching another car. The situation may be further complicated if the driver is suffering from night blindness. The various causes of night blindness as pointed out already are Vitamin A deficiency, diseases of the liver, poisoning from alcohol and inherited night blindness.

15.1.7. Normal balance of the two eyes

Abnormal muscle balance of the two eyes without the presence of frank cross eye is called latent squint and it has been already discussed in the chapter on cross eye. Presence of a latent squint is particularly harmful to an air pilot. While landing an aircraft a pilot having a latent squint technically called Esophoria may enter his plane into the ground thinking that he has not yet touched the ground. Another pilot having a latent squint technically called Esophoria may stop his plane thinking that he has touched the ground although he is still above the ground with the result that the plane falls down to the ground with a bang. Latent squint also interferes in the judgement of distances while driving a vehicle on the road. Usually testing of muscle balance of the eyes is not required before the issue of a licence to a vehicle driver but it is always tested in the case of air pilots. They are also tested every year to make sure that the defect has not appeared later. Any pilot having such a defect detected by a doctor should not insist on driving a plane because he not only endangers his own life but also of others.

16

Eye and General Diseases of the Body

There are a larger number of general diseases which also affect the eyes. In some diagnosis of a general disease can be made by the examination of the eyes and in others diagnosis may be confirmed by eye examination. Information regarding common diseases is given below.

16.1. High blood pressure

High blood pressure causes changes in the retina of the eye. These changes are of varying grades depending upon the severity of blood pressure and its duration. Every case of high blood pressure needs an eye examination as it gives an idea of the severity of high blood pressure. The effect of high blood pressure on the eye sight is usually none but if it happens, it is usually a sudden and almost total loss of vision in one eye. This is due to busting of a blood channel of retina. The free blood takes a long time to absorb and full recovery of vision is rare. Sometimes the total loss of vision may be due to blockage of a blood channel by a lump of blood elements. There is very little recovery of vision in these cases. The only way you can help to avoid it is to keep the blood pressure under control by carefully following the treatment prescribed by your physician.

16.2. Diabetes

Diabetes affects the eye in many ways. The commonest affection is the involvement of the retina. Other common affections are recurrent styes and cataract. In the retina diabetes causes small patches of blood which affect the eye sight. It can cause almost total blindness in both eyes. Longer the duration of diabetes, more are the chances of affection of retina. Usually, the changes in the retina occur after about 10 years of disease except in younger age when the affection of the retina can occur earlier. Simply it means that the patient showing diabetic changes in the retina must be suffering for a long time even though he becomes aware of it recently.

The only way to prevent it is to control diabetes by carefully following the treatment and the diet prescribed by the physician. If diabetes is existing in a family all the members should get themselves periodically checked for the presence of diabetes because early detection and treatment can prevent the involvement of eye.

16.3. Diseases of kidney

When kidneys do not function properly due to its own disease, two things happen. (1) Poisons are not eliminated in urine and they circulate in blood. (2) There is rise of blood pressure. Both these affect the retina and cause marked diminution of vision.

16.4. Diseases during pregnancy

In the later months of pregnancy, due to some unknown reason, poisons circulate in the blood and there is rise of blood pressure. Both these affect the retina in the same way as the diseases of the kidney. The condition is called toxaemia of pregnancy. Its salient features are sudden increase in weight, swelling of feet, diminution of urine, blood in urine, transient blurring of vision, recurrent flashes of light before the eyes and fits. *If the condition is not treated, death may occur.* It requires prompt treatment and if it does not subside by medicines, the pregnancy has to be terminated. The decision for terminating the pregnancy is also given by an eye specialist after an examination of the retina. Retinal changes are of varying degrees and if they do not regress with treatment within two weeks, there is a strong indication for terminating the pregnancy. If the eye changes are advanced, permanent defect in vision is the result. In these cases it is advisable to avoid future pregnancy.

The most important single factor in the recovery of the patient is the state of blood pressure. Presence of changes in the retina also indicate that it is a serious state.

16.5. Nervous diseases

Eye is a *direct outgrowth of brain* and it shares large number of diseases of the nervous system. Certain diseases cause headache and vomiting while others cause paralysis of a muscle of the eye. Both these conditions require examination of the eyes which can help in the diagnosis of diseases of nervous system.

16.6. Infectious fevers

Fevers like typhoid, influenza, smallpox, measles, meningitis, etc.. may affect the eyes. They may either affect the optic nerve leading to partial or total loss of vision. They may cause conjunctivitis and corneal ulcer.

From the preventive point of view in any long fever the eyes should be washed two to three times daily. Any redness, discharge or dimness of vision should be reported at once to the medical attendant. If the patient is unconscious or semiconscious, it should be seen that the black part of the eye remains covered by the lids. If any portion of the black part remains exposed, an ulcer will form. Children should be vaccinated against smallpox.

16.7. Herpes zoster

It is a condition in which small whitish pimples appear on the forehead and upper lid. It always affects one side and the pimples do not usually cross the midline. The eye lids are swollen and the eye waters and becomes red. The condition should be properly treated because if neglected it can cause some permanent loss of vision.

16.8. Nervous blindness

Nervous blindness occurs in persons suffering from neurasthenia, *i.e.*, a condition of the nervous system where an individual becomes easily fatigued from mental or physical exertion. It also occurs in hysteria and nervous states produced by shock or injury. Hitler's temporary blindness was due to hysteria. Such types of patients complain of painful burning sensations in the eyes for near work.

Medical attendant should be consulted for the nervous condition and for the eyes temporary cessation from reading and near work should be advised. Fresh air, exercise, going to bed early and easily digestible diet are advised. Harshness is bad for the patient.

17

Eye and Nutrition

A balanced diet includes adequate quantities of proteins, carbohydrates, fats, vitamins, salts and water. Proteins (which make flesh of body) is present in large amount in pulses, meat and milk. Proteins in pulses is of second grade because it is less easily digestible than that of milk and meat. Carbohydrates (sugar) are present in large amount in wheat, rice and sugar. People usually sieve the wheat atta and throw the bran which contains Vitamin B. In fact wheat atta should be consumed without sieving it. Things made of flour are digested with great difficulty. Rice cleaned by machine is called polished rice and loses its outer covering which contains Vitamin B. People who continuously take polished rice are liable to suffer from a disease called Beri-Beri which affects the heart and intestines and causes swelling of the body. Old rice is better than new rice because carbohydrates change into easily digestible form. Rice kept for a long time in a place where there is no moisture is good for eating.

Fat is present in ghee and oils. Pure ghee and butter contain plenty of Vitamin A, but the vegetable ghee does not contain it unless added to it.

Vitamins and salts are present in fruits and vegetables. Too much cooking and frying the vegetables destroy the vitamins.

All these items are essential for the maintenance of the health of the eyes. A general deficiency may occur during long illnesses. During that period or during the recovery of health after illness it is advisable not to do close eye work. A continued close eye work under these circumstances may cause elongation of eye balls and consequently myopia. A child suffering from some long illness should not be made to study for the sake of examination to save one year. He might be able to save one year of study at the cost of development of myopia.

17.1. Effects due to Vitamin A deficiency

The earliest sign of Vitamin A deficiency is night blindness. This may be accompanied with small white patches on the white area of the eye. If the deficiency is allowed to persist, cornea is affected It may soften and wounds might appear on it. This is an advanced stage of Vitamin A deficiency and the eye is usually lost. Such extreme defects occur in children who are suffering from diarrhoea and dysentry and are reduced to bony skeleton. To allow this stage to occur is a sheer neglect because the condition is easily and promptly treated by Vitamin A injection.

17.1.1. Prevention of Vitamin A deficiency

During pregnancy and lactation the mother's diet should be rich in calcium and vitamins. She should take at least one seer of milk, two ounces of butter and plenty of fruits and vegetables. The breast-fed babies of healthy mother will never get affection of the cornea because milk contains all the vitamins which are necessary. If the mother's health is poor, she should consult a doctor. If the mother's milk is not available for the infants, diluted cow's milk or powdered milk such as Oster milk or Cowgate milk should be given to the infants. The children who cannot get adequate milk should be given little Codliver oil. Vitamin A is present in large quantities in mangoes, guavas, bananas, tomatoes and papita. It is also present in milk, eggs, butter and fish oil. It is also called the vitamin of the eye.

17.2. Deficiency of Vitamin B

Deficiency of Vitamin B is rare now-a-days. It was noticed during war time among the prisoners. It occurs during severe malnutrition and affects the optic nerve which conducts the images on the retina to the brain resulting into marked diminution of vision. The defect is usually permanent unless treated early and promptly.

17.3. Deficiency of Vitamin C

Such a deficiency occurs in infants and there may be bleeding behind the eye balls which are protruded forward. By such forward protrusion, there is danger for the cornea which is deprived of the lubricating action of the lids. Wounds appear on the surface of the cornea and vision may be lost to a great deal.

No other vitamin is known to affect the eye singly.

18

Sudden Loss of Sight

Sudden loss of sight is rare in both eyes simultaneously. It usually occurs in one eye and it may be partial or total. Following are the common causes of sudden loss of sight.

18.1. Bleeding into the eye

For some reasons yet unknown blood channels in the retina rupture suddenly and blood enters into the vitreous. Such a condition usually occurs in healthy adult males between the ages of 20 and 40. The condition is absolutely painless and the only symptom is loss of vision. It is a serious condition from the vision point of view. Absorption of blood takes a long time and unfortunately bleeding recurs at variable intervals. The condition is called Eales's disease.

Since we do not know the cause of the condition, it is not possible to advise you the preventive measures. My personal feeling is that many diseases of body arise from indigestion which in turn is due to irregular habits of eating, over-eating, under-eating and drinking. By regular habits of eating of a nourishing balanced diet, avoiding overloading of belly you will respect your intestines. If you disrespect your intestines, not only they will weep, but other parts of the body will also shed tears in sympathy. Fruits and vegetables are essential part of the diet and should be given preference to sweats and flour preparation to fill the belly. If there is a septic matter in some part of the body as is common in teeth, tonsils, it should be eradicated. Use of fresh lemon juice (about 4—6 per day) with little water and salt are good during the disease. Rest to the eyes for some time should be given.

18.2. Detachment of retina

In this disease the retina undergoes splitting into two layers with collection of fluid between the two. This results in sudden defect in eye-sight. The actual onset of splitting may sometimes be preceded by momentary flashes of light appearing spontaneously in some part of field of vision. This warning sign may be followed by splitting of retina after few hours to few days, when the patient notices a shadow or a curtain obscuring vision in some part of the field of vision. It may be above, below, right or left depending on the site of split. The disease is more common in moderate and high myopia and occurs spontaneously or precipitated by factors like stooping, jerking of head, injury to the eye, pressure on the eye and *sheershasan* (standing on head). All these factors are harmless to healthy eyes but not to a diseased eye.

18.2.1. Prevention

1. People with moderate (—3·0 to —6·0) and high (above —6·0) myopia should avoid precipitating factors enumerated above. While picking an object from the floor they should sit and then pick instead of stooping.

2. If spontaneous flashes of light appear before the eyes, consult your doctor who will examine your eyes to see whether your eyes are prone to detachment of retina. If you are unable to consult a doctor for some time and if you are myopic, take rest in bed for 2-3 days. You should lie flat and keep your eyes closed as far as possible. There should be minimum movement of eye balls and you should look in front and move your head to look sideway instead of moving the eyes. In 2-3 days you will be able to consult your doctor who will advise you further.

3. If actual shadow appears before your eyes. you must either proceed to see an eye specialist and if not possible for some time, you should lie in bed. If the shadow appears in the lower part, lie flat and if in the upper part, lie with 2-3 pillows under the head. If the shadow appears on the sides, the head must be turned to the opposite side.

The treatment of this condition is only by operation.

18.2.2. Procedure in the Hospital

1. Patient's both eyes are bandaged and he is put on bed in a particular position depending on the position of split. In this position there should be no movement of the head but the other parts of the body can be moved.

2. Before the operation there is no restriction in diet.

3. The operation is done after a few days under local or general anesthesia.

4. After the operation patient is kept in a particular position, both eyes bandaged for 3-4 weeks with absolute immobilisation of head. Thereafter if all goes well he is allowed gradually out of bed and bandage is removed. He is given pinhole glasses to wear so that he can see only through the centre of the glasses. The idea is to avoid movement of eyeballs.

5. Patient is discharged about a week after he is allowed to get out of bed. He should take rest for about two months at home but can move about in the house.

6. The pinhole glasses are discarded after two months and numbered glasses are given. Black paper cut to the size of spectacle lens and with a central 2mm. hole pasted on the lens makes pinhole glasses. Both lenses are made pinhole.

7. There should be no jerking, stooping and physical strains on the body for six months.

18.3. Stoppage of blood circulation of retina

Blockage of blood channel of the retina may occur in certain diseases like high blood pressure and heart disease causing sudden loss of sight. You must at once see your doctor for this.

18.4. Quinine poisoning

Quinine taken in large quantity or even in small quantity in a susceptible person may cause sudden loss of eye-sight of both eyes. You should stop the drug, take plenty of water and consult your doctor as early as possible.

18.5. Disease of the optic nerve (Papillitis and Retrobulbar neuritis)

Sudden loss, partial or total, can occur due to swelling of the optic nerve. In majority of the cases we do not know the cause but some known causes are septic focus in the body, syphilis, diabetes and some diseases of the nervous system. You should consult your doctor as early as possible.

18.6. Temporary loss of vision

While changing the posture from lying to sitting or from sitting to standing, some people have black outs before their eyes for a short while. This is mostly due to general weakness, defects of blood in quantity and quality and heart disease.

18.7. Advice

On the appearance of sudden disturbance of vision in the manner indicated above a doctor should be consulted as early as possible. In some of the above conditions early treatment may save the eye-sight.

19

Ocular Hygiene in Relation to School

This chapter deals with all those influences which act injuriously upon the eye-sight of children.

19.1. School Building

The school building should be situated in a healthy locality as far as possible from narrow streets and adjoining high buildings, for the chief reason that they interfere with the lighting and with the free circulation of air. There should be no stagnant pools and deep hollows for the breeding of mosquitoes within a radius of half a mile. Ample space should be reserved for a play-ground. The class-rooms should face towards the south, for although a north light is more uniform, less brilliant and less heating than a south light, the latter is preferable because of the brightness and cheerfulness it imparts to a class-room. The south light is also warm in winter. The bright sunlight is also a destroyer of germs which pollute the air of badly ventilated and crowdy room. School rooms facing south would become uncomfortably warm but this disadvantage can be lessened by suitable curtains or chicks. The length of a class-room should not exceed 40 feet, because with greater length, it would be difficult for the pupils at the back of the room to read with ease the ordinary writing on the black-board.

19.2. Lighting of the class-room

It is a subject of vital importance for the health of the eyes.

19.2.1. Quantity of light

A rough estimate as to whether the room is sufficiently lit or not can be practically obtained by the ability or otherwise of a normal eye to read on a dull day and in the darkest corner at a distance of 12″. If the light is insufficient, the books would be kept close to the eyes with consequent eye strain. The amount of light entering into the room will depend upon the size and position of the windows. The proportion of window space to floor space in rooms having a southern aspect should be about 1 to 6 to 1 to 7 and for rooms looking north about 1 to 4 to 1 to 5.

19.2.2. Direction of main light

It should always come from the left of the pupils. The windows occupy one of the long sides of the room and the desks are arranged in rows at right angles to this side. Light from the right throws a shadow of the hand and the pen at the point of observation to avoid which the pupil is compelled to assume all sorts of uncomfortable and awkward positions. Lighting from two sides is also worse as double sets of shadows are produced on the paper. Light can come from the front but the direct glare not only causes discomfort and injury but makes it difficult for the pupils to see clearly the teacher's face or the black-board. Light from the back is unsatisfactory and insufficient as the pupil has to work in shadow of his own body. It could be a supplementary source of illumination.

19.2.3. Artificial light

Large and properly constructed roof lights in the form of bars produce excellent diffuse illumination The ceiling should be flat and whitewashed in order that as much light as possible may be reflected from it.

19.2.4. Windows

The windows should begin about 4 feet from ground and be carried as far up towards the ceiling as the height of the room and architectural necessities will admit.

The colour of the walls should be a light shade of green as it does not absorb too much light and is pleasing to the eyes.

19.3. School desks

Proper posture and seating of the pupils is important for the care of the eyes. Both myopia and curvature of the spine are in a large measure due to the wrong position of the pupil when writing or reading. In large number of schools, children have to sit on the floor or on a backless bench, or improperly constructed desks. This state of affairs is cruel to the children and should be eradicated. Unless a correct attitude is insisted in the primary schools the best constructed desks used in later years will not completely counteract the evils. An ideal desk should have the following qualities :

1. The height of the seat should be the same as the length of the child's legs measured from the inner band of the knees to the sole of the feet. With this height of seat, the soles will rest upon the floor.

2. The width of the seat should be the same as the length of the child's thigh measured from the inner band of the knees to the buttocks. The seat should have a slight concavity.

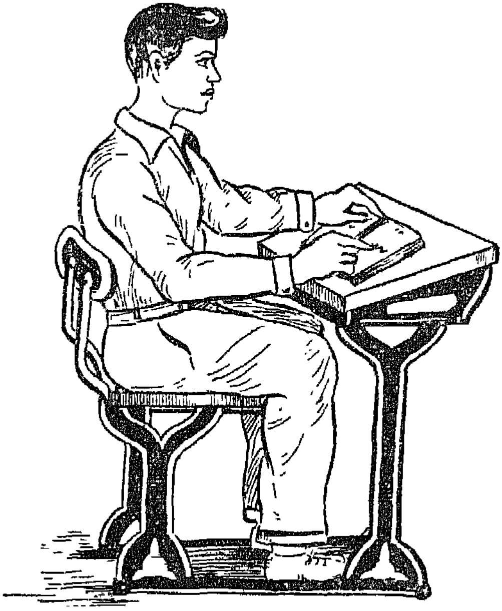


Fig. 19.1. Diagram of correct desk.

3. The front rounded edge of the seat projects 1 to 1½ inches under the inner edge of the desk, *i.e.*, the desk should slightly overhang the seat. In this position, reading and writing can be done at the standard distance of 12″ without any stooping.

4. The desk is sloped towards the pupil at an inclination of 15° to the horizontal. The seat should have a suitable rest for the lower part of the back of the pupil.

5. For children with height from 3 ft. 6 inches to 4 ft., the height from the seat to the edge of the desk should be about 8″ and the breadth of the desk from front to back should be 15″.

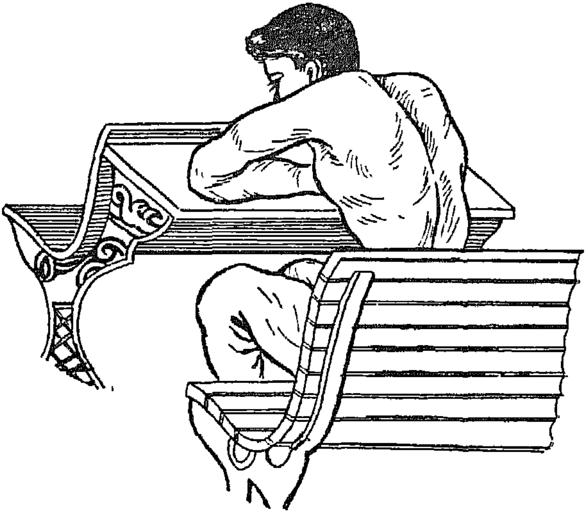


Fig. 19.2. Diagram of faulty desk (Too low)

19.3.1. Arrangement of Desks

The desks should be arranged in class-rooms in parallel rows at right angles to the main light with 18″ gangways between the two rows.

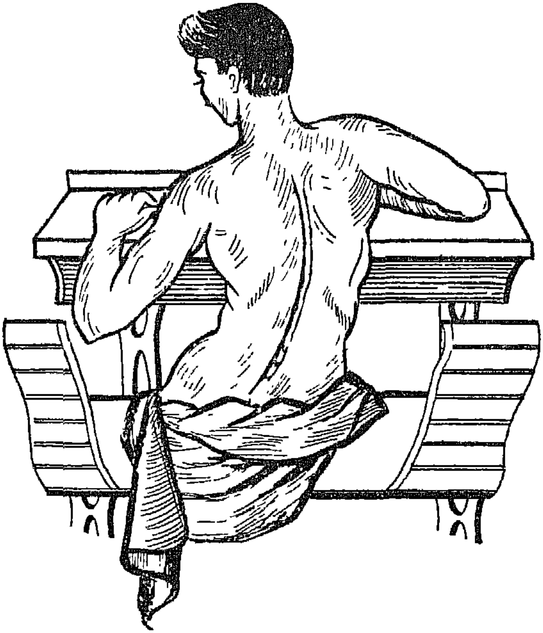


Fig. 19.3. Diagram of faulty desk (Too high)

19.4. Black Board

It should be black with unglazed surface. It should always be kept clean and unless this is done it will soon acquire a grey appearance from the adhesion of chalk particles to its surface. It will thus defeat the purpose of strong contrast between the black surface and white writing so essential for the easy visibility. It should not be placed at a distance greater than 30 ft. from the back row of seats because the average writing on the board (1″ letters), cannot be easily read by a normal sighted pupil at a distance greater than this.

With reference to the main light, the board should be so placed that no light should be reflected from its surface direct into the eyes of pupil.

19.5. Printing of Books

In general terms school books should not be printed too fine and the lines should not be too long or insufficiently spaced. The paper on which the books are printed should be opaque to prevent the type showing through, non-absorbent to prevent the ink stain becoming visible and unglazed to prevent the reflection of light.

19.6. Periods of Work and Rest

Young children from four to seven years of age should not be required to work more than three hours a day in school. The close application of the eyes to reading and writing should be reduced to minimum. The three hours work at school should be interrupted with play and recreation in the open air.

20

Eye Glasses

A substantial proportion of people who consider themselves the healthiest and most vigorous segment of our population have bad vision. Many do not know it. Others may know but do little about it. Why do many people deny themselves the blessings of glasses which give them perfect vision. Partly it is for the cosmetic appeal inherent in the civilised world of 20th century. I do not know any lady who thinks that she looks better with glasses. They would discard them if they could. But the truth is that the glasses are the only means of correcting many defects of eyesight. In many cases they not only help us to see better but also relieve us of such symptoms as headache, eye strain, burning and itching.

We wear glasses for two reasons :

1. To see well.
2. To see with comfort.

Whenever a patient reads 6/6 and yet the doctor tells him that he needs glasses, he is surprised and says "But doctor, my eye-sight is alright. I can see at long distances". The answer to this question is that the glasses in his case are not meant to improve the vision which he possesses alright, but to make his vision comfortable and to relieve his headache and eye strain.

Glasses cannot make an imperfect eye perfect because they do not change the structure of the eye. Even wearing wrong glasses does not injure the eyes permanently. There are many people who believe that they see well and are much surprised when an examination either for insurance or entry into service reveals poor vision. These people since the time they have become conscious of the panorama of the world have believed that whatever they see is a normal vision given by the

Almighty. They are not aware that they could see much better unless they happen to get themselves tested.

When glasses are worn there are certain questions which the patient asks.

Do I have to wear the glasses all the time ?

Such a question is hard to answer. Each case is a special problem. In general let me say that an eye that needs glasses is never better off without them. It may only be necessary to wear them when the eyes are at work, *i.e.*, reading, writing, sewing or in the cinema house. You may be able to dispense with them on the street, in a party or at dance when the eyes are not used intensely.

Sometimes an eye specialist, in spite of the feeling that glasses must be worn all the time by a patient, may compromise for less. I may be giving away a trade secret if I say that unless this is done, some patients will simply not wear them at all. It is a harsh thing to say that we are often driven to desperation by near sighted ladies who come year after year regularly to have their glasses tested, spend energy, time, and money for glasses simply to wear them in their handbags.

Another question asked frequently is the type of frame to buy. In most cases it does not really matter very much. For those who wear strong glasses, the full frame is better than the rimless type because of great solidity and firmness. This is specially true if the lenses contain correction for astigmatism. Such lenses if twisted slightly will make the vision blurred. Another caution is not to buy a frame which is perfectly round. Round lenses will sometimes turn in their frames because of constant handling or twisting motion of wiping if you do wipe them. This will throw them out of alignment.

As to the material and style of the frame your taste, money and optician will decide. Lenses will work as well in a steel fame as in one made of solid gold if fitted properly.

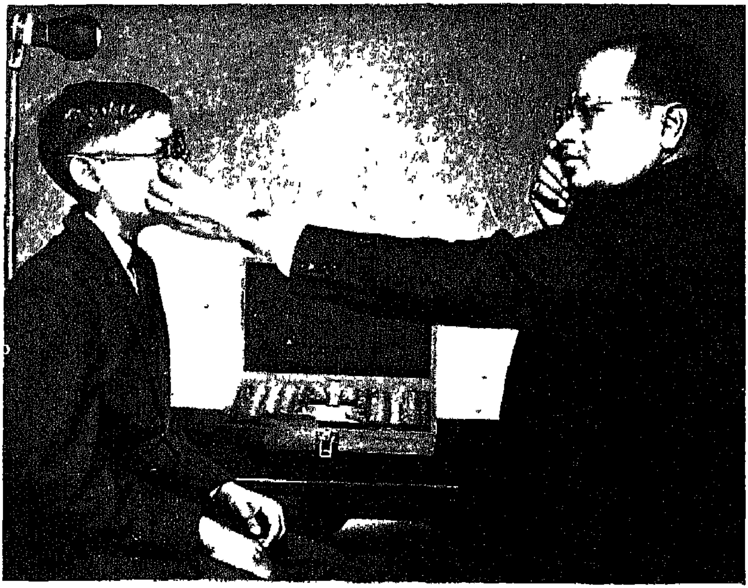
20.1. Contact Lens

Every one knows about the glasses which are worn on the face to improve the vision. Few only know that there are lenses which are fitted in contact with the black part of the eye. Such lenses are called contact lenses. When these glasses are worn over the eyes, they are not visible at all except when seen very carefully close to the eyes. These lenses are not yet popular in India partly because they are not manufactured as freely as ordinary glasses and partly because of high cost. There is also the difficulty of wearing them. Patient has to learn how to put these glasses over the eyes and the period for which they can be worn continuously varies with the individual. Usual wearing time is 4 hours to whole day. At night they have to be removed. Those who can tolerate them for few hours have to remove them for an hour or so and wear again. There are two types of contact lenses, a small one which fits over the black part of the eye and is smaller than the size of the black part, and a big one which also covers the white part of the eye. Choice between the two depends on the case.

Contact lenses, in spite of some handicaps mentioned above, are of great use. They are useful for actors and actresses and swimmers. They improve the vision of those who wear high numbered glasses because thick glasses do not give enough clarity. People whose one eye has been operated for cataract and the other eye is normal and who, as pointed out already, cannot wear glasses on the operated eye because of double vision may be able to wear a contact lens without seeing double. Factories manufacturing the contact lenses are few in India and the patient has to attend the factory on several occasions to give measurement and casts, etc. There are eye specialists in India who import ready-made glasses from foreign countries and fit on the patients' eyes.

20.2. Non-splinterable Glasses

Non splinterable glasses are advisable for children and for those adults who need glasses for games such as hockey, tennis, badminton and cricket or for dangerous occupation. They are more expensive than ordinary glasses but they insure your eyes against possible injuries due to breaking of glasses. Plastic lenses are also available which are cheaper but they are easily rubbed or scratched and need frequent changes for that reason.



Accurate method of testing eyesight. The author is testing the eyesight of a school child. One should not select a pair of glasses from the basket of a street hawker.

[*See page 103*]

20.3. Magnifying Glasses

Patients whose markedly defective eye-sight cannot be improved by any means, may be helped by using magnifiers. These magnifiers are (1) hand magnifiers which are kept on the paper to magnify the words , (2) telescopic spectacles which are worn on the face. Type and number of these latter type has to be determined for individual patients. Their availability is still difficult in India.

And now for a few don'ts

1. Don't fit yourself with a pair of glasses from a street hawker. There are a few individuals who are confident in their own abilities, exercising their rights and privileges as free citizens and proceed to buy their own glasses without a previous examination. Glasses obtained from such sources scratch easily, are unevenly surfaced and have coloured reflexes. Ill-fitting frames may chafe the ears and nose and sides over the face. Such glasses have both lenses of equal strength. Usually the glasses needed in both eyes are of different strength. The eyes can bear the abuse of wrong glasses for a long time but sooner or later the load of incorrect glasses becomes unbearable. But it is certain that no change in the structure of the eye ball occurs permanently due to wrong glasses.

2. Do not leave your glasses so that they rest on the lenses. This will get them scratched up very soon and cloud the vision. Tucking them into your pocket will also spoil them. Keep them always in their proper cover or put them on their frames. Do not handicap yourself with an artificial fog. You can wash with soap and water and dry with a clean cloth when the glasses are fogged.

Colour Vision

21.1. Historical

As far as we can learn from history, human beings first learned to recognise black and white, then red and yellow, and finally green and blue colours. Greater specialization came even later.

Our ancestors, long after they climbed down from the tree tops and got their land-legs, were apparently colour blind. The evidence is not conclusive but few facts are known.

(1) In all of Homer's writing of 3000 years ago—with its beautiful imagery and vivid description—there is little mention of colours.

(2) The Bible is relatively poor in colour allusions.

(3) Among the present day primitive races, notably natives of the Carolines in Polynesia, the same word is used to denote green, blue and black.

21.2. Infant's Colour Vision

Babies do not have any colour vision until they are three months old or later, *i.e.*, long after they can see. They cannot distinguish one colour from another until they are about fifteen months old or later.

21.3. Our Colour Filled World

Our present day world has become an entirely coloured existence. Variously coloured lights direct our daily movements horizontally on the roads and vertically in buildings. Coloured foods tintillate our palates and coloured scenes our eyes. We cheer our school colours and fight for our country's colours. Such is the importance of colour vision.

But there are some two crore people in this country alone who are deprived of colour vision. The incidence of these colour blind people is three to four per cent in the males and 0 3 to 0·4% in the females. These people have defective colour vision. We do not know why they lack the ability to recognise colours. We only know that the defect is present from the birth and is transmitted hereditarily. The manner of inheritance is such that the females transmit the disease to their male offsprings. To put it in the words of Bernard Shaw, "Females have conspired with nature to pass the disease mostly to their male offsprings leaving themselves relatively immune and able to appreciate the full glory of our colour filled world."

Besides inborn defective colour vision, the defect may also occur later in life due to some disease of optic nerve which connects the eyeball with the brain. In these cases there is marked diminution in vision also and as such there is little importance of defective colour vision.

We differentiate colours not only by their hues (*i.e.*, red or green or yellow), but also by their saturation (*i.e.* light green or dark green) and also by their intensity (brilliance) which means that under the same light yellow will be brighter than blue and orange than red. We are all colour blind in the dark. At dusk we cannot tell the difference between a red and green apple. As the intensity of light is reduced, colours lose their identities and become dark. But all colours do not fade at the same time. If you happen to see a garden of flowers at dusk, you will see an interesting thing. As the light fades, all the red flowers will gradually turn grey and then black ; then the violet, the blue, the yellow, and finally the green, in that order. Thus at night green is the brighest colour but in light, yellow is the outstanding colour. Hence the popularity of yellow as a wall paint in the home. Red is the least visible of lights at night and hence the photographers use a red dim light in their dark rooms for developing their sensitive films.

Objects have the property of selective absorption and reflection of light and it is by their reflected light that we know the colour of an object. Your suit is blue, your tie green, because these objects absorb all other colours and reflect blue and green respectively. Black car appears black because it absorbs all the light and reflects practically none. A white object reflects all the light and hence appears white.

Ordinary electric light is relatively yellowish, because it lacks some of the blue waves of the spectrum and it is for this reason that your blue suit looks black indoors. Fashion ladies insist on examining a cloth by day light before buying to judge colours exactly. A room painted dark green or dark blue requires from four to six times more light than the same room painted white or light yellow, because the darker colours absorb from 70 to 90 per cent of all the light whereas the lighter colours absorb only from 10 to 30 per cent and reflect the rest into the room as useful illumination. It becomes an economic factor. It is for this reason that a darkened room in summer is cooler and light coloured garments are popular in summer because the wearer feels cooler. There are such many different ways in which colour vision is useful to us.

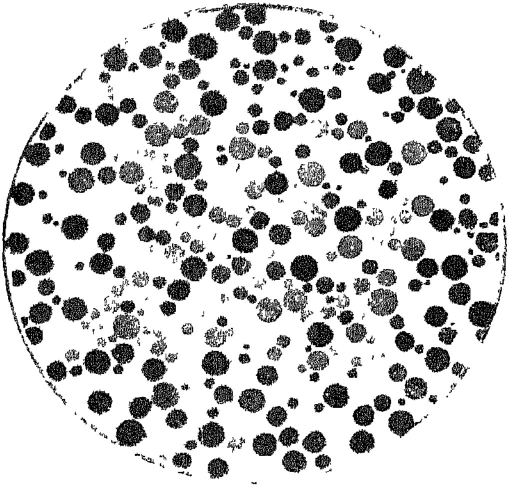
21.4. Defective Colour Vision

So much for the normal colour vision through which we appreciate and enjoy the glory of our coloured world. Now let us turn to a section of our population who are deprived of normal colour sense. Defective colour vision is mostly for red and green colours and it may be annoying to the red and green colour blinds that for traffic lights red and green colours have been chosen as if to deprive them from jobs connected with transport. The reason for choosing these colours is as follows :—

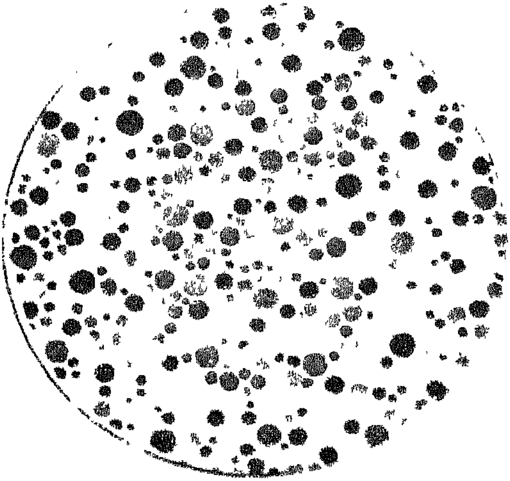
Blue colour has less luminosity and in fogged weather it is still less than that of red and green. Purple is not used because through the covering glass it is confused with red and luminosity is poor. Yellow and orange are easily confused with white under adverse weather conditions as fog. This leaves red and green which are comparatively more luminous. But there is no test for colour vision for drivers and yet there are few accidents due to colour defects. The reasons for this are as follows :—

1. The colour blind has learnt by experience that red is brighter than green and by this clue he differentiates.

2. Red light is above the green light and on the lights words "Stop" and "Go" are written. By this knowledge a colour blind driver can tell which light is on.



Is this 29 or 70 ? If the latter, you are red-green blind



Do you see the figure 6 easily ? If not, your colour vision is poor.

3. Careful driver simply follows the traffic. He watches others and acts accordingly.

It will not be unsafe to make a colour blind driver fit for driving vehicles on the ground. But certainly it will be risky to make him fit for air, railway and marine services.

It is advisable to have a child's colour vision tested in school so that he can decide his future career early instead of repenting at the time of entry into service when he is told that he is not fit for the job he seeks because of colour vision defect.

In old age the lens inside our eye becomes somewhat brownish and our perception of blue and violet is weakened because these colours are filtered out somewhat by the brown lens. All white objects appear slightly brownish. In most cases this is of little consequence but it is of great importance to artists and painters. They tend to overload their paintings with blues like the deaf man who shouts because of his own bad hearing. There is no remedy to remove the defect of colour vision which is present from the birth. Those who have gross colour defect cannot distinguish between the colours and will not be able to name the colour of an object. Others with minor or moderate defects are able to name the colours of an object shown to them. This they do due to experience. For example if a colour defective person is asked to name the colour of a letter-box, he will shout at once that it is red because he has learnt it. Such people are liable to make mistakes when put under new circumstances and into adverse weather conditions like fog. It is therefore not safe for these people to enter into railway, air and ship services not only for their own sake but for many who are dependent on them.

You may get a rough idea about your colour vision by reading the plate.

22

Coloured Glasses

Coloured glasses are commonly used by the people partly to protect the eyes from the strong sunlight and partly to decorate the faces. They are standard vacation and sport equipment. From the protection point of view with which we are concerned coloured glasses protect the eyes from the infra-red rays and the ultra-violet rays of the natural light. As you know the natural light has a spectrum which consists of seven colours, *i.e.*, violet, indigo, blue, green, yellow, orange and red. The range of wave length is 400 to 700 micron. The rays less than 400 micron are ultra-violet rays and more than 700 micron are infra-red rays. These two types of rays, when in sufficient concentration, can harm the eye.

The ultra-violet rays are present in snow covered areas, in arc lamp light and cinema studios. Infra-red rays are present in strong sunlight and during solar eclipse.

22.1. Your Questions

Many patients usually ask the following questions about the sun glasses :

(*i*) When should sun glasses be worn ?
(*ii*) What colour of lens is best ?
(*iii*) How dark should they be ?
(*iv*) Do they ever hurt the eyes ?

The answers to such questions are as follows :

(*i*) Generally speaking sun glasses should be worn to protect the eyes when there is too much light and glare. They should be worn if looking at a solar eclipse or during an electric welding or working in cinema studios.

(ii) Colour. It makes very little difference as to what colour we choose. All coloured lenses, if sufficiently dark, protect the eyes from the unwanted rays.

(iii) Depth of tint of sun glasses. This factor is of much greater importance. The ability of a lens to keep out unwanted light depends directly on the depth of its colour. They should be dark enough to keep out at least half of all the light. Tinted glasses are usually sold in four shades, *i.e.*, A, A2, B1, B2. Those marked B1 and B2 are suggested.

(iv) Tinted glasses do not have any bad effect on the eyes provided the glasses are not of cheap quality. These cheap quality lenses have bubbles and streaks inside them which cause a certain amount of dispersion of light. The eyes have to neutralise this irregular dispersion of light by its power of accommodation. A persistent demand of this neutralisation of dispersed light may sometimes lead to eye strain which is always temporary. However wearing the glasses for a short time as usually is the case, even these cheap type glasses can be acceptable.

Tinted glasses interfere with the discrimination of colour and hence they should not be used under such circumstances. However smoke tinted glasses have the least effect on colour perception.

The infra-red and the ultra-violet rays are invisible. They have nothing to do with the glare. Glare is caused by concentrated visible light rays. The infra-red rays are also present in glass blowing and chain making factories. A type of cataract is found among the glass workers and chain makers if they do not wear the protective glasses.

The most important safety step against too much light and glare is the correction of all refractive errors of the eye. Eye fatigue on a long automobile drive is a common instance, and even the darkest glasses are ineffective if the refractive errors are not corrected.

The cheap glasses make you artificially near sighted or far sighted or astigmatic.

They may make you near sighted in one eye and far sighted in the other eye. This is due to the number present in the tinted glasses. A good lens will not show the slightest movement of the objects looked at through it when the glass is moved about. If there is the least movement, the glasses are numbered and should be rejected. Another point to look is to see any bubbles and streaks inside the glass. Hold the lens against a light and look for any fine streaks or bubbles. It should be uniformly transparent.

Some persons have got into the habit of wearing deeply tinted lenses all the time, *i.e.*, day and night, indoors and outdoors. Ladies will occasionally wear dark glasses to hide the appearance of the crow's feet seen at the outer corners of the eyes, that are so stubbornly resistant to cosmetics, massage and beauty clinics. Their eyes become accustomed to dim illumination and then even normal amount of light becomes objectionable. It is not a permanent damage but it is a bad habit.

People who need to wear tinted glass most of the time are albinos and those who are allergic to light. When the eyes are inflamed or diseased, dark glasses are necessary. They are also necessary in certain industries where injuries to the eyes are common. Various types of coloured glasses are sold in the market. They are as follows.

22.2. Varieties

1. *Chances Crooks Glasses.* They are available in four shades A_1, A_2, B_1 and B_2. A_1 has a slight yellowish tinge. A_2 has bluish tinge. B_1 and B_2 are smoky colours in different shades. Normally A_1 and A_2 are prescribed but when tinted glasses are required to protect the eyes from sun, B_1 and B_2 are prescribed. They cannot be used at night.

2. *Colobar Tinted Glasses.* They have three shades B, C, D. They have green tint and are more bright than crooks B_1 and B_2.

3. *Crooks Lite.* They are pink in colour and have one shade only.

4. *Neophan Glasses.* They are in four shades called 25%, 50%, 75% and 94%. 25% is grey and others are bluish in colour.

5. *Gradosole.* It has a brownish tint. Here the upper part of the glass is heavily tinted and it gets gradually less below. It is useful for both outdoor and indoor work.

Of the many varieties I can recommend from personal experience the chances crookes B_2 which neither changes the natural colour nor depresses the wearer and can be ground to any prescription. Neophan glasses have come to the market recently. They are equally good.

Our eyes are made for light. Tinted glasses should and only be worn when there is too much light for the normal eye or when the normal amount of light is too much for an abnormal eye. All else is vanity.

23

Miscellaneous Conditions

There are a few conditions which individually do not warrant a separate chapter. They have been grouped together in this chapter.

23.1. Pinguecula

Pinguecula is a yellowish white spot seen on the white part of the eye close to the limbus. It is situated at 9 O'clock and 3 O'clock positions of limbus. It usually appears in old age, but sometimes appears earlier. Majority of the people have got it in varying sizes. It has nothing to do with eye-sight and one should not worry for it. If it becomes so prominent that an individual is worried about its presence in his social life, it can be removed by operation. This operation is simple and has nothing to do with eye-sight.

23.2. Oscillation of Eyes (Nystagmus)

By nystagmus we mean an automatic movement of the balls. The condition in majority of cases is present from birth. In some cases it appears in infancy or early childhood and in few cases appears later in life. Thus from the age point of view it falls into three groups.

First Group : When present from birth it is hereditary in origin and there is no cure for this condition. These cases have low vision which hardly can be improved with glasses. Usually they have sufficient vision to permit them to study because near vision is better than distant vision. They have better vision when one eye turns in and in order to turn one eye in, they usually tilt their heads. It is an unfortunate hereditary disease for which at present we have no treatment. Their vision is usually sufficient for the job of a peon, a daftri or a L.D.C. and equivalent jobs. I feel that they should not be debarred from these jobs.

Second Group : Nystagmus occurring in childhood is always due to marked interference in the vision of both eyes like cataract, glaucoma or some disease of the retina. Once it appears in a child who had no abnormal eye movement, you should consult your doctor promptly for treatment. If allowed to persist, it may become permanent even if the cause is removed.

Third Group : In this group it occurs later in life and is either due to some ear trouble or some nervous disease. These patients feel that the objects move continuously and this causes confusion and vomiting. This is a serious disorder not only from the disabilities mentioned but sometimes life may be in danger due to the causative disease and therefore you should consult your doctor as early as possible. Patient does not see movement of objects in first and second groups.

23.3 Flying Flies

Many patients complain that they see some tiny objects moving in front of their eyes and they start worrying for it for fear of loss of eye-sight. There are two reasons for it.

(1) Some abnormal matter enters the vitreous due to disease in the surrounding structure and one sees the shadow of this abnormal matter.

(2) There is no disease of the eye and the shadow is due to minute particles of which the vitreous is made. These shadows may be seen by those having perfect eye-sight with or without glasses but it is more common in those who wear minus glasses.

Whatever be the cause consult your doctor who will place you in one of the above two groups. He will give you treatment for the former and assure you for the latter. The best treatment for these shadows, whatever be the cause, is to ignore them and forget completely. The more you are conscious of these, more you try to see and more worried you become. These shadows are more visible if you look up towards the clear sky. If you are constipated or your digestion is not correct, it should be set right. Such shadows also appear in front of a cataract operated eye. The above remarks equally apply to it also. These shadows are technically called Muscae Volitantes.

23.4. Night Blindness

It means that the patient has difficulty in vision after dusk or in dark room. There are large number of causes of this symptom but only two are common. And I shall confine my description to these two.

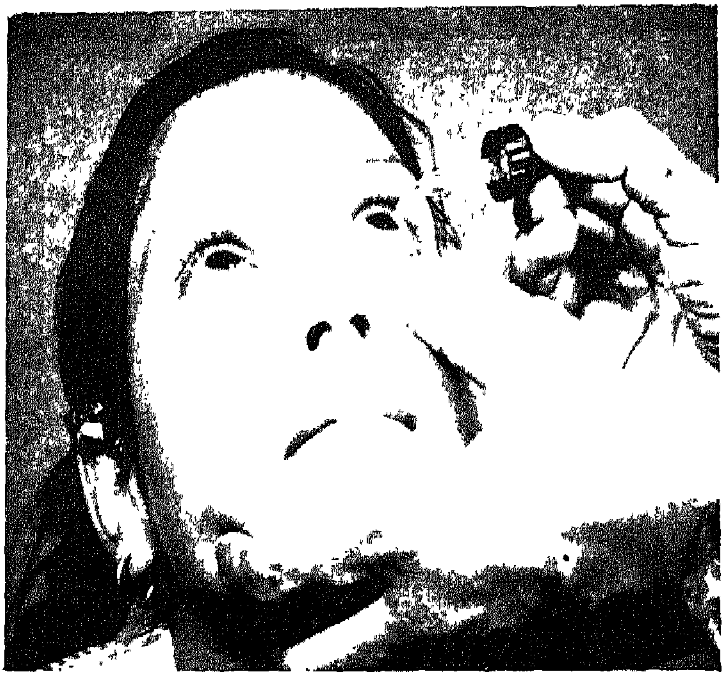
One common cause is lack of vitamin A. The deficiency is either in the diet or there is defective absorption from the intestine in cases such as bad liver, chronic diarrhoea and dysentery. It is common in children. Besides night blindness there may be small white dry patches on either side of the black part of the eye at 3 or 9 O'clock position. The condition is easily treated and night blindness disappears but the white patches remain for a long time. The object of the treatment is to cure night blindness. If there is no night blindness and there are only white patches, treatment is not required.

The second common cause is a disease of the retina called Retinitis Pigmentosa. It is a hereditary disease and runs in generations. It is not necessarily present in all generations. If father and mother do not have the disease which is present in their children it definitely means that they are carriers of disease. When two disease carriers marry, the result is the appearance of the disease in some of their children. There are certain laws of inheritance of diseases and to prevent the occurrence of these diseases it is advisable to consult a doctor before settling the marriage.

The patient complains of night blindness and defective eyesight. The disease is present from the birth in very mild form and progresses very slowly. The patient begins to have these symptoms usually between the age of 15 to 30 years. It may progress to virtual blindness by the age of 50 to 60 years. Rarely cases remain stationary. Once the disease is discovered in a patient, all his brothers and sisters and parents need examinations, whether any of them has also got the disease.

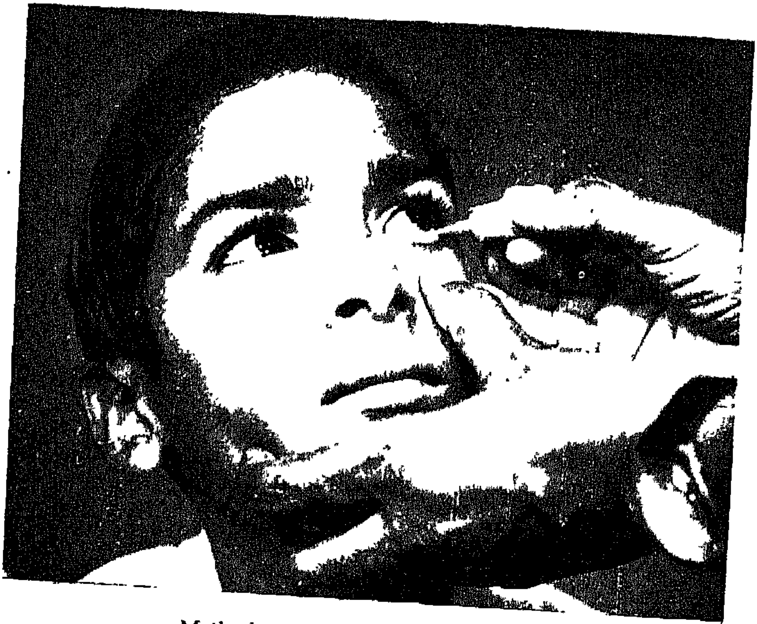
Unfortunately there is no treatment for this condition at present. All those who have the disease should learn such trades by which they can earn their living even if the vision becomes very low. Apart from education some hand work must be taught which he can do without the use of eye-sight. The disease is sometimes complicated with cataract which becomes an additional menace to the eye-sight at an early stage.

Those who wear high numbered glasses plus or minus also have poor visibility in darkness. Diseases of liver, inherited night blindness and alcohol poisoning are other rare causes.



Method of putting drops in the eye.
Dropper should not touch the eye ball.

[*See page 115*]



Method of applying eye ointment.
Nozzle should not touch the eye ball.

[*See page 115*]

24

Eye Procedures

Proper application of medicines to the eyes is essential for the success of treatment. Economy should be observed and it should be remembered that more can be added if needed but that any excess will be wasted because it cannot be poured back into the bottle or tube. A number of eye procedures will now be described in detail.

24.1. How to put Drops

As a rule one drop is a sufficient dose for the eye but there is no danger if more are instilled at a time. However excess merely flows out over the lid which is wasteful and is unpleasant for the patient. The label on the bottle should be carefully checked. Instances have occurred where other medicines not used in eyes have been used accidentally with damage to the eyes. The patient sits on a stool or a chair and his chin is tilted up so that the head is thrown back a little. The patient is asked to look up and the lower lid is drawn down by means of a finger. The drop is gently released in the space between the eye ball and the lid. The tip of the dropper should be about an inch high from the eye ball. Immediately after the drop the patient closes his eye for a minute or so. He should neither squeeze nor blink.

Most of the eye drops are contained in a bottle with an eye dropper. It is important that the tip of the eye dropper should not touch any part of the eye ball otherwise infection may be transmitted to the bottle. If there is no dropper with the bottle a separate dropper has to be used. After use it should be washed and kept in a clean place preferably covered in a clean cloth. It should not be used for any other medicine whether it is for eyes, ears or nose.

24.2. Ointments

Eye ointments are dispensed either in collapsible tubes or in small card-board boxes. If it is issued in a tube a gentle pressure ejects the ointment in the form of a string. In hot climate the ointment melts and it comes out in the form of a semi-solid drop.

24.2.1. How to apply Ointment

(*a*) *From a tube.* The lower lid is pulled down and the ointment is squeezed direct from the tube into the space between the eye ball and the eye lid, the patient looking upward during the procedure. About one centimetre of ointment is a sufficient doze. Too much ointment comes out on the eye lashes and the skin of the lids, where it is not only unpleasant but also has the undesirable effect of collecting dust. If the ointment has melted, a gentle squeeze of the tube brings out one semi-solid drop of ointment into the space created by pulling the lower lid down. The nozzle of the tube should not touch any part of the eye otherwise you infect the tube. Immediately after applying the ointment the cover should be replaced and the patient should keep the eye closed for two minutes until the ointment melts.

The pressure on the tube should be very gentle because by more pressure the ointment continues to come out when the pressure is released.

(*b*) *F om a Card-Board Box.* Issuing of ointments in card-board boxes is no doubt economical but it has a disadvantage of being contaminated. There is also the difficulty of applying the ointment unless clean specially made glass rods are supplied with it. Application of ointment with a finger is against hygienic principles. The best way is to use a glass rod. A little ointment is applied to the end of the rod, lower lid is pulled down, the patient looks up and the end of the glass rod is placed in the space created. The patient closes the eye and the rod is smoothly withdrawn by a rotatory motion, the ointment being retained beneath the closed lids. The rod is then cleaned and put in boiling water for few minutes. This method may also be used for struggling children since the glass rod is unlikely to damage the eyes. It is a difficult procedure to apply the ointment to struggling child by means of a tube. The following procedure is suggested :

The child's head is supported between the knees and another helper controls the hands and the legs. With the left hand the lids are separated with pressure over the eye ball. The ointment is released into the lid aperture. The nozzle should be *kept about one to two centimetres above the aperture.* If drops are to be used the same procedure may be followed with one difference that the drop should not be placed directly over the black part of the eye. It should be dropped to the inner or the outer side of the black part. Patient feels a great deal of discomfort if the drop strikes the black part of the eye and he is afraid of getting drops for the second time.

24.3. Hot Fomentations

1. A spoon, preferably a wooden one, is taken because a metal one may become too hot to hold.

2. The bowl of the spoon is padded with cotton wool and secured by threads.

3. The patient sits on a chair with a table in front of him (unless confined to bed) with protected towel in front of him.

4. The patient holds his head over the bowl containing the hot water and closes his eyes to prevent entry of steam into it.

5. The padded end of the spoon is dipped into the boiling water and then brought close to the eye. The steam is allowed to waft over the closed eye.

6. As it cools the spoon can be brought closer to the eye but it should not touch the lids. They may be burnt.

7. The process is repeated for ten minutes.

8. More boiling water is added as necessary.

9. Hot fomentations may be carried out three to four times a day.

10. Allow the eye to cool for ten minutes before the introduction of drops or ointment because the effect of some drugs is impaired by heat.

24.4. Washing of the Eyes

Washing of the eyes is best done by a patient at home by an eye cup sold in the market. It is filled with the lotion and the cup is applied to the eye so that the eye ball dips into it. Movements of the lids and the eye ball should be done to wash the crevices between the lids and the eye ball. Lotion should be changed frequently. The lotion may either be boric lotion or salt lotion. But even ordinary water is as good as a lotion. Salt lotion is prepared by putting one tea spoonful of salt in one pint (10 chhtanks) of water. The temperature of lotion or water is roughly 100 degree F which is lukewarm. Sometimes washing of the eyes is advised with cold water which means as cold as bearable but not icy cold. Cool water from an earthen pitcher in summer season is ideal.

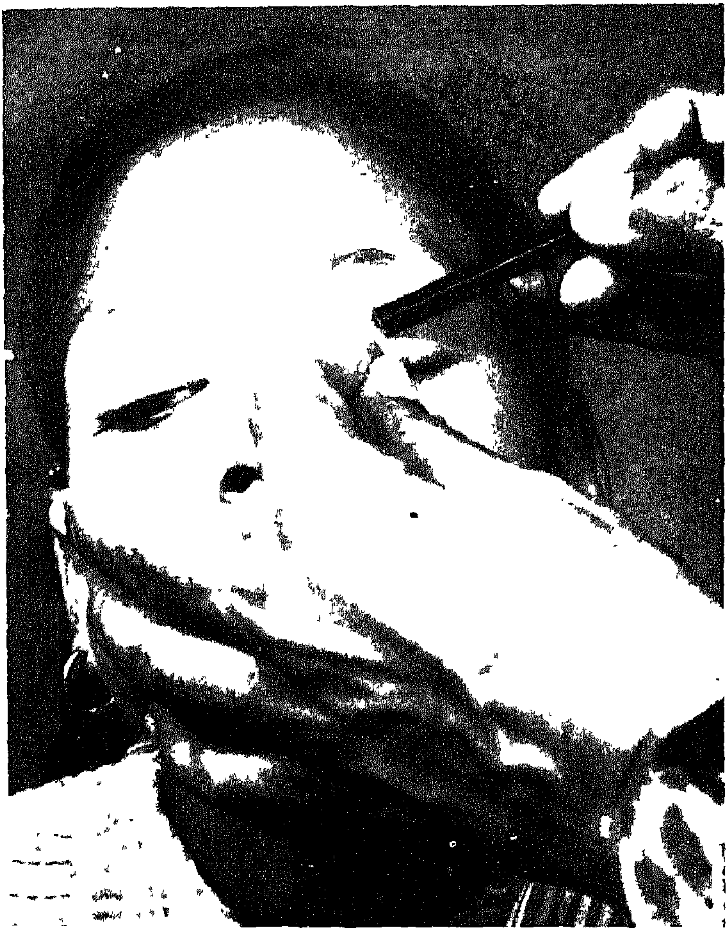
24.5. How to evert upper Eye Lid

1. Ask the patient to look down.
2. Catch hold of the free margin of the lid or eye lashes near their roots between the thumb and forefinger of your left hand.
3. Put the end of a pen, pencil, hair pins or index finger of your right hand on the surface of the lid about one centimetre from the lid margin.
4. Evert the lid by using the object in right hand as a fulcrum. You will see the red inner surface of the lid.
5. Your hands must be clean before everting the lid.

The only indication for you to evert the eye lid is when a small foreign body like a piece of coal or dust has entered the eye and is likely to be present on the inner surface of the lid. If a doctor is not available soon, a friend can help the sufferer by wiping off the foreign body with a clean handkerchief. The foreign body usually appears black and is easily spotted.

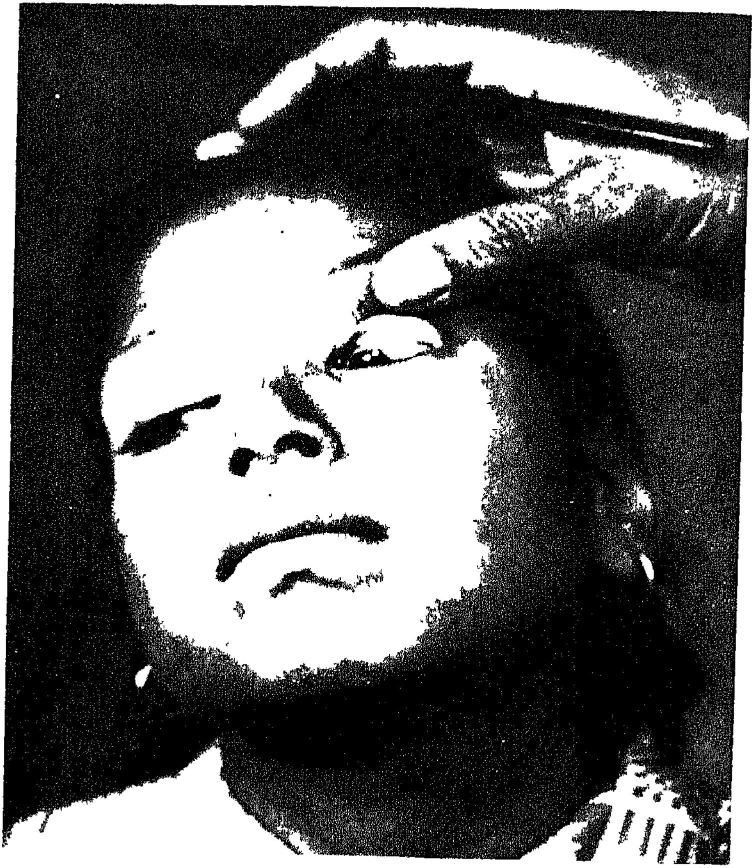
24.6. Medicines

You must have wondered that throughout the book there is no mention of any medicine. I have deliberately avoided the treatment of the eye diseases by medicines by the patient themselves without consulting an eye specialist. The book is written on preventive lines and to acquaint the public with the knowledge of recognising the common eye diseases and as to what is severe and what is trivial from the point of view of vision. The eye is a highly complicated organ and the use of medicines by



Method of turning upper lid inside out.

[See page 118]



Upper lid is turned inside out.

[*See page 118*]

non-technical persons without consultation with the doctor may keep him in false hopes. However I mention below certain medicines which one could keep in his house and use it on the appearance of an eye disease if it is not possible to consult a doctor early. These medicines are harmless whatever the disease may be. In some they would be very useful while in others they will be useless but harmless.

(*a*) *Antigerm Ointment.* There are various ointments under this heading such as penicillin, terramycin, Aureomycin, Nebasulph Ointments, etc. You may buy any one of these and keep in a cool place.

(*b*) *Triphla Lotion.* Take equal parts of Amla, Harr and Bahera.[1] Wash them with water and then dry. Prepare coarse powder and take one teaspoonful of this powder and add it to two ounces of water. Let it remain for the whole night in a small earthen or glass pot with a cover on it. Filter the lotion in the morning through a thick clean cloth or filter paper and use it for eye wash.

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[1] Amla—Eblic Myrobolan.
Bahera—Myrobolan Behiru.
Harr—Myrobolan.

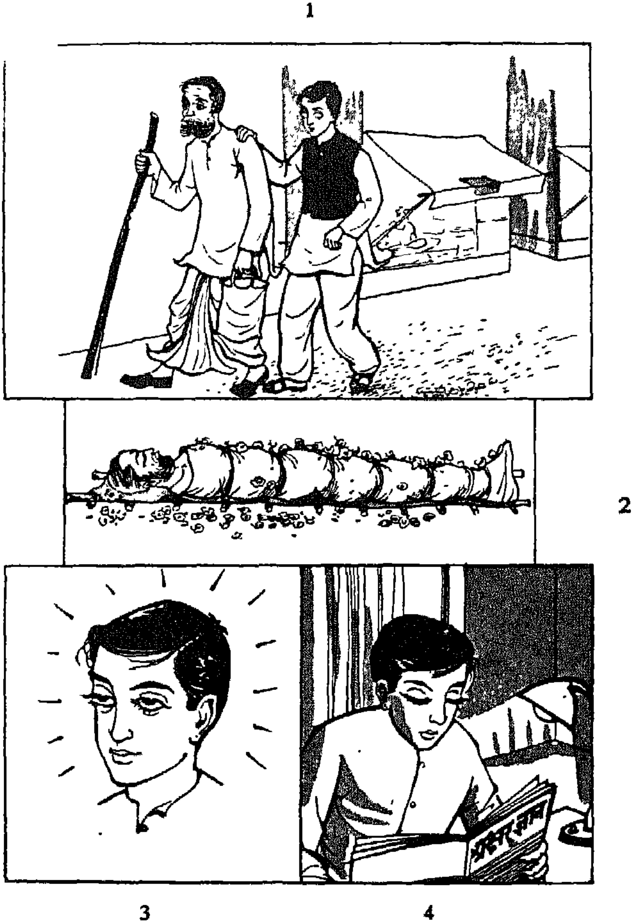
.25

Corneal Grafting

Corneal grafting, also called corneal transplantation or Keratoplasty, is an operation in which a small window is cut in an opaque cornea and replaced by a piece of clear cornea. This clear cornea is obtained from a dead body within two hours of death. This cornea can be preserved for about a week in a refrigerator. In India people do not donate the eyes of their deceased for reasons of sentiment and superstition. In France there is a law that the dead body's eyes can be removed without the consent of the relatives and perhaps the necessity of the law arose because people in that country were not willing to donate the eyes of their deceased.

There is no doubt that this method of treatment can restore the eye-sight to many blinds, even in some cases to the extent of 100% but alas this method of treatment is still not prevalent in India, mainly because of lack of donor material. I would appeal to the public that they should shed the sentiments and superstitions and help in restoring the blinds their lost eye-sight by freely donating the eyes of their deceased. However, I do not want to raise false hopes. Many people seem to think that a hopelessly bad eye could now be traded in for a good one. This is not true. It should be known that this operation is on the cornea only, which by reason of injury or disease has become opaque so that vision is impaired. The eye behind the cornea should be healthy. Even amongst the opaque corneas there will be selection of cases for operation. It is no secret that even after an operation the clear window may become opaque and we do not yet know why. In spite of some shortcomings it is a treatment which has restored eye-sight to many and is an important advance in eye surgery. It is the result of many years of experimentation and research and is freely done in the West.

This is what Corneal grafting can do.



(1) Blind boy is led by his grandfather.

(2) Grandfather dies.

(3) Eyes donated by the grandfather are utilised for the boy who gets his vision.

(4) Boy is now able to start his education.

[*See page 120*]

Before the Government has to compulsorily enact a law, I suggest that following procedures for obtaining the eyes of a dead body may be adopted.

A permission form should be supplied to the potential donor which he signs and gives to his nearest relative. This will bring more eyes to the eye bank as the wish of the deceased usually has a binding moral effect in the surviving family. After the death of the donor, the family members notify the doctor or hospital concerned that the eyes are to be donated for corneal grafting and sign the release authorising the removal of the eyes. Legally, of course, the consent of the family members without the expressed wish of the deceased is sufficient.

Eyes of an unclaimed dead body cannot be utilised since a long delay occurs prior to postmortem.

Attending doctors may suggest to the family of an obviously dying patient the possible contribution of his eyes for corneal grafting.

26

Summary

The sense of sight is so important that every possible care should be taken to preserve it by proper care of the eyes. No apology therefore is offered for some degree of recapitulation in the remarks which follow.

1. Before the birth of a child an expectant mother should take every care to avoid exposure to German measles as cataract has been known to be produced in the baby.

2. If there is any discharge from the private parts of a pregnant woman the doctor should be consulted. Early appropriate treatment may avoid the infection of the baby's eye at birth.

3. Immediately after birth the baby's eyes should be wiped with moist cotton wool from the nose outwards before the eyes are opened. The bath water from the first bath should not be allowed to get into the baby's eyes. A drop of 1 % Silver Nitrate should be put in each eye. Any discharge from the baby's eye should be reported to the doctor. It is readily cured by penicillin ointment and delay might prove dangerous.

4. If a baby after the age of six months is seen to squint he should be referred to an eye specialist. If it is neglected, vision is almost certain to deteriorate. If there is a delay in consulting an eye specialist the healthy eye should be bandaged so that the squinting eye has no chance of losing vision.

5. The delicate eyes of growing children should not be subjected to eye strain. These eyes should be tested at an early age (3 years) and thereafter it should be done at regular intervals.

6. Short sighted children require more attention than ordinary children because they require good light in which to work. They should be made to adopt a proper posture when engaged in work. A myopic child should be given books with large legible prints.

7. The glasses of school children should be made of unsplinterable material. They are in the habit of quarrelling with each other, in playing carelessly and may break their glasses and a piece of glass may enter into the eyes causing an irreparable damage. By use of unsplinterable glasses you are at least insuring the eyes of your child.

8. During attack of some infectious diseases like measles, smallpox, typhoid, influenza, etc., care should be taken of children's eyes. Any discharge or diminution of vision should be reported to the medical attendant. Excessive light should be avoided by dark glasses. Reading should not be allowed during illness and during recovery of health.

9. Colour vision should be tested in the early school life as colour blindness is a great handicap in certain occupations. Early detection of this defect may make you to choose the future career of your child.

10. During adult life illumination for work should be adequate. In dangerous trades protective glasses should be worn. On reaching the age of forty, the necessity for reading glasses arises. It is no use to go through a period of discomfort before you realise the need of glasses.

11. Elderly people should report any slow diminution of vision to their medical attendant. Common causes are cataract, glaucoma, tobacco poison, diabetes and a disease of the retina called macular degeneration.

12. If an eye becomes red, medical advise should be sought at once. The two dangerous conditions are acute glaucoma and iritis.

13. Any sudden loss of vision in an eye should be reported at once. Early diagnosis and treatment in some cases may restore the eye-sight to a considerable extent.

14. Great care should be taken if a foreign body gets into the eye. The foreign body should be removed at once if possible by a doctor. Eye should not be rubbed.

If a child has the following signs he should consult a doctor about his eyes.

(*a*) Frequent blinking and rubbing of eyes.

(*b*) Over-sensitivity to light.

(*c*) Screwing of lids to see at a distant object.

(*d*) Covering one eye or tilting the head while reading.

(*e*) Stumbling over small objects.

(*f*) Inflammed or watery eyes.

(*g*) Squints while looking at distant or near object.

(*h*) The child cannot read the clock from a distance but goes close to it to observe the time.

(*i*) The child holds the book very close to the eyes.

(*j*) The child cannot see the writing on the black-board from the back of his class or during cinemas he cannot read the words written on the screen and cannot enjoy the film.

Now you are approaching the end of the book and you will have realised that the constantly repeated burden of my song is "Acheing eyes should receive prompt and competent attention." The light of the body is the eye, was said 2000 years ago and it is just as true today. Do not let your light grow dim.

APPENDIX I

Visual Requirement for the Public Services

Services have been divided into technical and non technical and separate standards have been prescribed for different categories.

Technical services include the following services :

1. Railway Engineering Service (Civil, Electrical, Mechanical and Signal), Transportation (Traffic) and Commercial Department, Watch and Ward Department and posts on the marine establishment.

2. Central Engineering, Class I and Class II, Telegraph Engineering Class I, Electrical Engineering Classes I and II, Survey of India Classes I and II, Engineering Branch of the Overseas Communication Services Classes I and II, Technical Officers, Classes I and II of the Inspection Wing of the Directorate General of Supplies and Disposals.

Non-technical Services

1. I.A.S., I.F.S., I.A. & A.S., Indian Custom Service, Indian Railway Accounts Service, Indian Defence Accounts Service, Medical Stores, Establishment Department of the superior revenue establishment of the Indian Railways and other posts, Income-Tax Officers (Class I, Grada II and Class II) Service, Indian Postal Service (Class I), Military Lands and Cantonments Service Classes I and II, Geological Survey of India Classes I and II, Technical Officers of Wireless Planning and Co-ordination Organisation Classes I and II and other Central Civil Services I and II.

2. Indian Police Service.

There is no limit for minimum naked eye vision. The following standards are prescribed for distant vision and near vision with or without glasses for different types of services.

Class of Service	*Distant Vision*			*Near Vision*	
	Better eye		*Worse eye*	*Better eye*	*Worse eye*
Class I and II both Technical and non-technical	6/9		6/9	0·6	0·8
		or			
	6/6		6/12		
Class III.	6/6		nil	0·6	0·8
	6/12	or	6/12		
	6/9		6/18		
Class IV.	6/9		nil	no standard	
	6/18	or	6/18		
	6/12	or	6/24		

Limit of Number of Glasses

I. All Technical Services Classe I and II and Indian Police Service

Total amount of Myopia including the Cylinder should not exceed −4·00 D. Total amount of Hypermetropia including the cylinder shall not exceed plus 4·00 D.

II. Non-technical Services other than Indian Police Services.

(*a*) *For candidates up to the age of 20 years.* Total amount of myopia shall not exceed −6·00 D. Total amount of Hypermetropia shall not exceed plus 6·00 D.

(*b*) *For candidates above the age of 20 years.* Total amount of myopia shall not exceed—8·00 D. Total amount of hypermetropia shall not exceed plus 6·00 D.

III. Classes III and IV Services

There is no limit for the number of glasses in respect of these services provided their vision is in accordance with the standards mentioned above.

IV. Colour Vision

1. The testing of the colour vision is essential in respect of the following Class I and Class II services.

(*a*) All technical services.

(*b*) Indian Police Service.

(*c*) Medical Officers. Employed under the Ministry of Railways.

2. In respect of Class III and IV Services in the Ministry of Railways colour vision is also tested. In respect of other Class III and IV services a test for colour vision shall be carried out only when specifically asked by the Department.

V. Eye conditions other than standard of Vision

The following eye conditions are considered as a disqualification.

(*a*) Any organic disease or a progressive deterioration in vision is considered as a disqualification.

(*b*) *Trachoma.* Trachoma unless complicated is not ordinarily a cause for disqualification.

(*c*) *Cross eye.* For classes I and II technical services and the Indian Police Service where the presence of binocular vision is essential, cross eye, even if the vision is of the prescribed standard, is considered a disqualification. For other services the presence of cross eye is not considered as a disqualification if the vision is of the perscribed standard.

(*d*) *One-eyed persons.* One-eyed persons are disqualified for regular Class I and II services. They are accepted in Class III and Class IV services provided the functioning of the only eye is not likely to be endangered by the condition of the worse eye and the visual standards mentioned above are fully satisfied.

However one-eyed individuals are not altogether excluded from employment in Class I and Class II service on a contract basis provided the visual standard in the functioning eye is 6/6 for distant vision and 0·6 for near vision and the number of the glasses is not more than plus or −4·00 D.

The above standards are rigidly followed by the medical boards. Relaxation of these standards is however allowed when the age of the candidate at the time of first appointment is 35 years or more. In such cases the standard for corrected vision is reduced by one step as explained below.

	Corrected Vision		
	Better eye		*Worse eye*
Class I and Class II Services.	6/12		6/12
		or	
	6/9		6/18
Class III Services.	6/9		nil
		or	
	6/18		6/18
		or	
	6/12		6/24
Class IV Services	6/12		nil
		or	
	6/24		6/24
		or	
	6/18		6/36

When a candidate is declared medically unfit on account of eyes any appeal preferred by him/her is dealt with by a special medical board, the composition of which includes two eye specialists Ordinarily the findings of this special medical board are considered as final but a second appeal is permissible in doubtful cases and under very special circumstances. It is open for the Government to relax any one of the conditions in favour of any candidate for special reasons.

APPENDIX II

Visual Standards

1. Candidates for admission to the National Defence Academy (N.D.A.)

Visual Acuity.	**Standard I**	
	Better Eye	*Worse Eye*
Distant Vision	V=6/6	V=6/9 Correctable to 6/6
Near Vision	Reads 0·5 or J 1	Reads 0.5 or J 1
	Standard II	
Distant Vision	V=6/12 Correctable to 6/6	V=6/18 Correctable to 6/9
Near Vision	Reads 0·5 or J 1	Reads 0·5 or J 1
	Standard III	
Distant Vision	V=6/24 Correctable to 6/6	V=6/24 Correctable to 6/12
Near Vision	Reads 0·5 or J 1	Reads 0·5 or J 1

A candidate with defective colour vision is not rejected. There should be no disease of the eye.

After completion of the N.D.A. Course, the Selection for various branches of the Armed Forces is based on the following visual standards.

Army	Vs. III	(Minimum Standard) Normal colour vision is not essential.
Navy	Vs. I	(It is not essential for the vision in the worse eye to be correctable to 6/6).

Night vision, colour vision and muscle balance must be normal. Eyes are also tested to find out whether the candidate will need glasses at a later date, and if so the limits permissible are as follows :

Better Eye	
Hypermetropia	plus 1·5 or under
Astigmatism	plus 0·75 or under
Hypermetropia and Astigmatism.	The maximum power in any one meridian permissible is plus 1·5 and plus 0·75 for astigmatism.
Worse Eye	
Hypermetropia	plus 2·5 or under
Astigmatism	plus 1·5 or under
Hypermetropia and Astigmatism.	Maximum power in any one meridian permissible is plus 2·5 and plus 1·00 for astigmatism.
Air Force	Vs. I. No glass will be worn.

All other standards are the same as for Navy.

2. Candidates for Admission to the Miltary College

Standard I

	Better Eye	*Worse Eye*
Distant Vision	V=6/6	V=6/6
Near Vision	Reads 0·5 or J 1	Rrads 0·5 or J 1

Standard II

Distant Vision	V=6/6	V=6/60 Without glasses not below 6/60 and after correction with glasses not below 6/24.
Near Vision	Reads 0·5 or J 1	Read 0·5 or J 1

Standard III

Distant Vision	V=6/60 Correctable to 6/6	V=6/60 Correctable to 6/24

Near Vision.	Reads 0·8 or J 4	Reads 1 or J 6
Minimum Standard	...	Standard III

Defective colour vision is not a cause for rejection.

On completion of training at the time of commissioning, a relaxation of distant vision without glasses may be made and individuals with unaided vision of less than 6/60 in each eye accepted for commission in ASC, AOC, EmE, AEC and RVFC provided corrected vision is not less than 6/6 one eye and 6/18 in the worse eye.

There should be no disease of the eye.

3. Candidates for the Grant of a Commission in the T.A.

Officers—A candidate will be considered fit if his vision without the aid of glasses is not less than 6/60 with each eye provided that with the aid of glasses if necessary, his vision is not less than 6/9 in one eye and 6/18 in the other.

A candidate will be considered fit if he has one eye (R or L) with vision of not less than 2/60 and with good field of vision as tested by hand movements provided that his vision in the other eye is not less than 6/12 without glasses and capable of correction to 6/6 with the aid of glasses.

Defective colour vision will not be a cause for rejection.

JCOs & OR	Infantry Artillery I.A.C.	Right eye 6/12 Left eye 6/12	or	Rt. eye 6/6 Lt. eye 6/36
	Others	Right eye 6/24 Left eye 6/24	or	Better eye 6/12 Worse eye 6/36

There should be no disease of the eyes.

4. Candidates for National Cadet Corps

Officers & Cadets

(*a*) Vision, without aid of glasses, is NOT less than 6/60 with each eye, provided that, with the aid of glasses, his vision is NOT less than 6/9 in one eye and 6/18 in the other.

(*b*) Defective colour vision will not be a cause of rejection.

5. Candidates for Admission to the Sa[illegible]ool

Candidates will be examined in accordance with the Army Visual Standards for admission to the N.D.A. Those candidates whose vision is below Standard I but not below Standard III will be assessed as "PROVISIONALLY FIT".

Note : Cadets whose visual acquity after admission to the School deteriorates but does not fall below standard III of the N.D.A will be allowed to continue.

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